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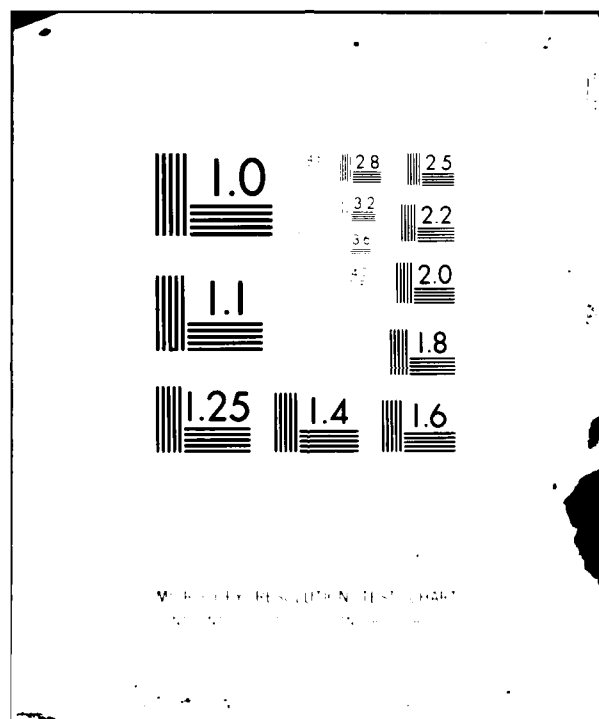
TENNESSEE STATE DEPT OF CONSERVATION NASHVILLE DIV 0--ETC F/G 13/13  
NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS, TENNESSEE. --ETC(U)  
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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. <i>AD A108 242</i>	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) National Program of Inspection of Non-Federal Dams, Tennessee. Colonial Country Club-16th Hole Dam (Inventory Number TN 15774) near Memphis, Tennessee, Shelby County, TN. Wolf River Basin		5. TYPE OF REPORT & PERIOD COVERED Phase I Investigation Report
6. AUTHOR(s)		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Winsett-Simonds, Consterdine & Associates, Inc. P.O. Box 40045 Memphis, Tennessee 38104		8. CONTRACT OR GRANT NUMBER(s)  DACW-62-81-C-0056
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Colonial Country Club-16th Hole Dam has a 4.5 acre lake and is located in Shelby County, Tennessee in the Countrywood subdivision, and is an earth fill embankment 25 feet high and 344 feet long. The crest varies from 10 feet to 15 feet in width. Facilities for discharge from the reservoir are located in the west abutment and include a timber covered concrete structure with a 5.3 foot by 0.77 foot opening that is located in the emergency spillway ten feet landward from the control section of the emergency spillway. The emergency spillway has a cross-tie weir nine feet long. Excess water not intercepted		

by the service spillway is carried in a swale located between the toe of the dam and the foundations of two houses. The embankment slopes are one vertical on three horizontal. The upstream slope is partially protected by light riprap. Both the upstream and downstream slopes have undesirable vegetation. The dam is in the small size category and has a downstream hazard potential classification of high by the Corps of Engineers and I by the State of Tennessee. On the basis of hydraulic analysis, the dam flood storage (15.7 acre-feet) and spillways are adequate to safely pass the 1/2 Probable Maximum Flood (PMF), which Office of the Chief of Engineers (OCE) Guidelines specify to be the design flood for a dam in the small size and high hazard categories.

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DEPARTMENT OF THE ARMY  
NASHVILLE DISTRICT, CORPS OF ENGINEERS  
P. O. BOX 1070  
NASHVILLE, TENNESSEE 37202

IN REPLY REFER TO

1 SEP 1981

ORNED-G

Honorable Lamar Alexander  
Governor of Tennessee  
Nashville, TN 37219

Dear Governor Alexander:

Furnished herewith is the Phase I Investigation Report on Colonial Country Club 16th Hole Dam near Memphis, Tennessee. The report was prepared under the authority and provisions of PL 92-367, the National Dam Inspection Act, dated 8 August 1972.

The report presents details of the field inspection, background information, technical analyses, findings, and recommendations for improving the condition of the dam.

Based upon the inspection and subsequent evaluation, Colonial Country Club 16th Hole Dam is classified as deficient due to growth of small trees and brush on the embankment.

The recommendation concerning removal of the trees and brush on the embankment and others contained in this report should be undertaken in the near future.

Public release of the report and initiation of public statements fall within your prerogative. However, under provisions of the Freedom of Information Act, the Corps of Engineers is required to respond fully to inquiries on information contained in the report and to make it accessible for review on request.

Your assistance in keeping me informed of any further developments will be appreciated.

Sincerely,

LEE W. TUCKER  
Colonel, Corps of Engineers  
Commander

1 Incl  
As stated

CF:  
Mr. Robert A. Hunt, Director  
Division of Water Resources  
4721 Trousdale Drive  
Nashville, TN 37220

PHASE I INSPECTION  
COLONIAL COUNTRY CLUB 16th HOLE DAM  
SHELBY COUNTY, TENNESSEE

Prepared By:  
WINSETT-SIMMONDS, CONSTERDINE & ASSOCIATES, INC.

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM  
TENNESSEE

Name of Dam Colonial Country Club - 16th Hole  
County Shelby  
Stream Tributary Fletcher Creek  
Date of Inspection April 2, 1981

This investigation and evaluation report was prepared for the Tennessee Department of Conservation, Division of Water Resources by Winsett-Simmonds, Consterdine & Associates, Inc., P.O. Box 40045, Memphis, TN 38104.

Prepared By:

Wm. E. Bush, P.E., Director  
Civil & Water Resources Engineering





## ABSTRACT

Colonial Country Club - 16th Hole Dam has a 4.5 acre lake and is located in Shelby County, Tennessee in the Countrywood subdivision, and is an earth fill embankment 25 feet high and 344 feet long. The crest varies from 10 feet to 15 feet in width. Facilities for discharge from the reservoir are located in the west abutment and include a timber covered concrete structure with a 5.3 foot by 0.77 foot opening that is located in the emergency spillway ten feet landward from the control section of the emergency spillway. The emergency spillway has a cross-tie weir nine feet long. Excess water not intercepted by the service spillway is carried in a swale located between the toe of the dam and the foundations of two houses.

The embankment slopes are one vertical on three horizontal. The upstream slope is partially protected by light riprap. Both the upstream and downstream slopes have undesirable vegetation.

Colonial Country Club 16th Hole Dam is in the small size category and has a downstream hazard potential classification of high by the Corps of Engineers and I by the State of Tennessee.

On the basis of hydraulic analysis, Colonial Country Club - 16th Hole Dam flood storage (15.7 acre-feet) and spillways are adequate to safely pass the  $\frac{1}{2}$  Probable Maximum Flood (PMF), which Office of the Chief of Engineers (OCE) Guidelines specify to be the design flood for a dam in the small size and high hazard categories.

At this time, the dam is considered "deficient". It is recommend that a qualified engineer be engaged to: determine the feasibility of relocating the emergency spillway so that the house sites that presently adjoin this facility would be protected; recommend a plan for the removal of undesirable brush and trees from the side slopes; recommend repairs to the telephone cable trench on the downstream slope; and develop an emergency action plan to alert downstream residents in the event a major problem develops with the dam.

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OLD MELMEO  
OVERVIEW PHOTO

PHASE I INSPECTION  
COLONIAL COUNTRY CLUB - 16th HOLE DAM  
SHELBY COUNTY, TENNESSEE

SECTION 1 - GENERAL

- 1.1 Authority - The Phase I inspection of this dam was carried out under the authority of the Tennessee Code Annotated 70-2501 to 70-2530, "The Safe Dams Act of 1973", in cooperation with the Corps of Engineers under the authority of PL 92-367, "The National Dam Inspection Act".
- 1.2 Purpose and Scope - This report is prepared under guidance contained in Department of the Army, Office of the Chief of Engineers, Recommended Guidelines for Safety Inspection of Dams, for a Phase I investigation. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspections. Detailed investigation and analysis involving topographic mapping, subsurface investigation, testing and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. Additional data or data furnished containing incorrect information could alter the findings of this report.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

1.3 Past Inspections - An inventory reconnaissance trip was made to Colonial Country Club - 16th Hole Dam by the Division of Water Resources, State of Tennessee.

1.4 Miscellaneous Details - On the day of the Phase I inspection, the weather was fair with temperatures in the mid 70's and the wind was estimated at 10 m.p.h. with gusts up to 15 m.p.h. The level of the lake was approximately at the elevation of the invert of the emergency spillway.

1.5 Inspection Team Members - Field inspection was performed by the following Winsett-Simmonds, Consterdine & Associates, Inc. personnel:

William E. Bush, P.E.  
Civil Engineer

Dr. Fred H. Kellogg, P.E.  
Geotechnical Engineer

The team was accompanied by Messrs. George Moore and David Roe of the Tennessee Division of Water Resources.

## SECTION 2 - PROJECT DESCRIPTION

2.1 Location - The Colonial Country Club - 16th Hole Dam is located in Shelby County, Tennessee in the Countrywood subdivision north of the Rock Creek Parkway between Pembroke Fairway and Hanksmoor Place. It can be located on USGS Map, "Ellendale - 400 NE", at longitude  $89^{\circ}47'07''$  and latitude  $35^{\circ}11'22''$ .

### 2.2 Description

2.2.1 Embankment - The Colonial Country Club - 16th Hole Dam is an earth embankment dam with a southeast-northwest orientation, a maximum height of 25.0 feet, and a length of 344 feet. The crest width averages 12 feet. The upstream slope averages 1V on 3H from the waterline to the top of the dam. The downstream slope averages 1V on 3H.

The dam was constructed of a silty clay derived from the loess. The fill belongs to group "CL" in the Unified Classification System, with medium plasticity and very low permeability. It appears to be well compacted. The natural soils in the abutments are loess and re-deposited loess and alluvium in the valley. The re-deposited loess is a bluish-gray silt belonging to group "ML" in the Unified System and is probably less than ten feet thick and rests on loess. Below the loess, and about 15 feet below the surface at the bottom of the valley, is a terrace deposit (Lafayette Formation) consisting of clayey sands and gravels (Groups "SC" & "GC").

2.2.2 Service Spillway - The service spillway is located in the west abutment of the dam and is unusual in that the service spillway entrance is located approximately 10 feet landward from the control section of the emergency spillway. The service spillway opening is 5.3 feet wide and 0.77 feet high (See Appendix B). The 30 inch exit pipe is located along the downstream toe of the dam and terminates at a junction box which also serves as a surface water inlet for the area at the toe of the dam. A 42 inch concrete drain pipe exits the junction box, and is part of the subdivision storm drain system.

2.2.3 Emergency Spillway - The emergency spillway is located in the west abutment and has a concrete control section approximately ten feet long with the abutment side slope of 1:6 and the dam side slope of 1:6. The emergency spillway has a flat section approximately 50 feet in length, which includes the service spillway located as noted above. The weir of the service spillway is located approximately 0.2 feet below the control section elevation. It is estimated that the service spillway carries 50% of the maximum flow of the emergency spillway. Excess water is carried in a swale located between the toe of the dam and the foundations of two houses.

2.2.4 Reservoir and Drainage Area - The reservoir has a surface area of 4.6 acres at normal pool elevation with a fetch of 700 feet. The normal impounding capacity of the reservoir is estimated to be 29.8 acre-feet with an additional 15.7 acre-feet of flood



storage. The drainage area is 26.7 acres and the predominant soil is Memphis silty loam.

- 2.2.5 Miscellaneous - The dam was built approximately 50 years ago as a farm pond. The design and construction history was not available at the time of inspection. The dam was altered during subdivision development, although the type and extent of the alterations is unknown.

## SECTION 3 - INSPECTION FINDINGS

### 3.1 Specific Findings

#### 3.1.1 Embankment

Geology - The dam is constructed of a silty clay derived from the loess, a wind deposited silty material that covers most of Shelby County. The fill belongs to group "CL" in the Unified Classification System with medium plasticity and very low permeability. It appears to be well compacted. The natural soils are made up of loess in the abutment and re-deposited loess and alluvium in the valley. The re-deposited loess is a bluish clay silt belonging to group "ML" in the Unified System. The re-deposited loess is probably less than ten feet thick and rests on loess. The terrace (Lafayette Formation) consisting of clay sands and gravels, (Groups "SC" and "GC") lie approximately 15 feet below the surface of the bottom of the valley.

Abutments - There were no deficiencies noted on either abutment. Both abutments are covered with a good sod that is being maintained as lawn for the adjacent property.

Upstream Slope - The upstream slope has several small trees all under six inches in diameter and multiflora rose bushes scattered along the upstream slope. Most of the upstream slope is vertical caused by wave action. Slope protection is afforded by light riprap consisting of broken concrete on the

west third of the dam. The condition of this riprap is fair but wave action is causing deterioration. The slope protection is fair on that portion of the slope protected by the riprap. No gradation of the riprap could be observed.

Crest - The crest of the embankment has a straight alignment with a southeast-northwest orientation. The crest of the dam is in fair condition, with a few depressions that were caused by maintenance vehicles and small burrowing animals, dogs, etc. No excessive erosion was noticed on the crest of the dam, nor were surface cracks or transverse surface cracks observed.

Downstream Slope - Two thirds of the downstream slope is covered by trees up to six inches in diameter with many saplings and small bushes. Several small benches were observed on this slope. A telephone service cable has been installed in a trench approximately ten feet below the crest. This trench runs the entire length of the dam and also has a lateral cable installed running down the backslope. The entire length of the trench has subsided and is now causing an erosion problem. (Holes were noted all along the telephone trench). No other surface cracks or evidence of heaving was noticed. A boring was made during this inspection with a hand auger at the toe of the dam. A tight, dry clay was found down to approximately the three foot depth at which ground water was encountered. There was no

toe drain system observed for this dam. The west third of the slope is being maintained as lawn by the adjacent property owners and is in excellent condition.

Area Below Downstream Toe - The area below the downstream of the embankment is a fully developed urban subdivision with drainage improvements. There was no evidence of piping, boils, or seepage in this area.

- 3.1.2 Seismic Zone - The Colonial Country Club - 16th Hole Dam is located in Seismic Zone 3. No record of any stability analysis could be found.
- 3.1.3 Seepage - No signs of seepage were observed on the downstream slope or on the toe of the dam. An auger hole was drilled at the downstream toe at approximately the highest part of the dam. Ground water was found at a three foot depth in the auger hole.
- 3.1.4 Spillways - The emergency spillway is located in the west abutment and is a vegetated, earth spillway. This spillway is unusual in that a portion of the flow is intercepted by a concrete structure located approximately ten feet from the control section and is conducted down a chute to a 30 inch concrete pipe. The remaining flow that cannot be intercepted by this portion of the spillway passes by the concrete box into a swale located near the foundations of two houses.

At the time of this inspection, the water level was located just above the control section and what little water was flowing was passing into the concrete chute. There was no significant erosion in the emergency spillway.

3.1.5 Downstream Inspection and Hazard Classification - The downstream hazard potential classification for the Colonial Country Club - 16th Hole Dam is high. Rockcreek Parkway is located approximately 400 feet downstream of the dam and ten to 15 houses are located within the margins of the probable flood path.

3.1.6 Hydrology and Hydraulics - According to O.C.E. Guidelines, dams with a high hazard, small size classification should have storage and spillway capacity to pass the  $\frac{1}{2}$  PMF to full PMF without overtopping the dam. The Probable Maximum Precipitation (PMP) of 29.7 inches in six hours yields a  $\frac{1}{2}$  PMF of 12.36 inches. Time of concentration was estimated to be 0.2 hours and flood storage from normal pool to the low point of top of dam is estimated to be 15.7 acre-feet. Routing of the  $\frac{1}{2}$  PMF, (Antecedent Moisture Condition II), produced a peak outflow of 67.91 cfs, which was contained below the crest of the dam with 0.5 feet freeboard.

The 100 year 6-hour, (AMC III), flood was routed through the structure. The 100-year 6-hour precipitation was 5.6 inches and a peak outflow of 16.73 cfs. Colonial Country Club - 16th

Hole Dam contained this storm with a flow of 0.8 feet in the emergency spillway and a freeboard of 2.0 feet.

### 3.2 CONCLUSIONS AND RECOMMENDATIONS

#### 3.2.1 Conclusions

- a. Colonial Country Club - 16th Hole Dam spillways and storage appear adequate to prevent overtopping of the dam in the event of the  $\frac{1}{2}$  Probable Maximum Flood (PMF).
- b. There is no effective means to draw down the lake for maintenance or in case of an emergency.
- c. The Colonial Country Club - 16th Hole Dam poses a high hazard potential to the downstream development. The original dam was built as a farm pond approximately 50 years ago. The dam appears to have been altered for the subdivision development and the type of alterations is unknown. The present location of the spillway with earth waterway through the backyards poses considerable hazard for the homes located along this waterway in the event of a major storm.
- d. The telephone cable installed in a trench all along the backslope is developing holes along the entire length of the trench.
- e. No signs of slope instability were observed.
- f. Colonial Country Club - 16th Hole Dam is in Seismic Zone 3. Stability analysis of the embankment with earthquake loading is not within the scope of this report.

- g. The natural vegetation on both the upstream and downstream slopes need maintenance. Brush, trees and other undergrowth are undesirable.
- h. Colonial Dam is in fair condition, but the deficiencies on the downstream slope and the location of the emergency spillway warrants the condition classification of deficient. (See Appendix G).

### 3.2.2 Recommendations

- a. A qualified engineer should be retained to:
  - 1. Recommend a plan to the owner for the removal of brush and trees from both the upstream and downstream slopes of the dam.
  - 2. Upon removal of vegetation on the slopes, make thorough examination of the embankment to determine any indication of instability and check for any problems that may be present, i.e., holes, rills, cracks, and so forth and recommend remedial measures if needed.
  - 3. Make an engineering study to determine the feasibility of relocating the emergency spillway and service facilities so that the house sites that presently adjoin this facility would be protected.
  - 4. Recommend repairs for the telephone line trench to prevent further erosion in these trenches.
  - 5. Evaluate the stability of the dam with earthquake loadings.

6. Develop a maintenance schedule for future inspections of the embankment and spillway on at least an annual basis.
7. Develop an emergency action plan to alert downstream residents in the event that a major problem develops with the dam.



#### SECTION 4 REVIEW BOARD FINDINGS

The Interagency Review Board for the National Program of Inspection of Non-Federal Dams met in Nashville on 2 June 1981 to examine the technical data contained in the Phase I investigation report for Colonial Country Club 16th Hole Dam. The Review Board considered the information and recommended that (1) the jug hole at Station 3 + 20 should be repaired, (2) the conclusions should state that there was no evidence of slope instability, and (3) an emergency action plan should be developed, including a warning system to alert downstream residents, in the event a serious condition develops with the project. They agreed with other report conclusions and recommendations. A copy of the letter report presented by the Review Board is included in Appendix H.

APPENDIX A  
DATA SUMMARY SHEET

# APPENDIX A DATA SUMMARY SHEET

## A.1 DAM - Colonial Country Club - 16th Hole Dam

A.1.1 Type - Earth Fill

A.1.2 Dimensions and Elevations - Elevations were determined from a 4" property boundary marker (Station 1 + 50).

a.	Crest length	344 feet
b.	Crest width	10-15 feet
c.	Height	25.0 feet
d.	Crest elevation	342.5 feet
e.	Service spillway elevation	339.6 feet
f.	Emergency spillway elev. right	339.8 feet
g.	Embankment slope, U/S (from water surface to crest)	1V on 3.8H
h.	Embankment slope, D/S (from lower slope to crest)	1V on 2.6H
i.	Size classification	Small

A.1.3 Zones, Cutoffs, Grout Curtains None

A.1.4 Instrumentation None

## A.2 RESERVOIR AND DRAINAGE AREA

A.2.1 Reservoir - (Normal pool elevation 339.8, 2.8 feet below the effective crest).

a.	Surface area	4.6 acres
b.	Length of pool	700 feet
c.	Capacity (Normal pool)	29.8 acre-feet
d.	Maximum surface area	6.2 acres
e.	Flood storage	15.7 acre-feet

A.2.2 Drainage Area

a.	Size -25.6 acres (0.04 square miles)	
b.	Characteristics:	
	Average watershed slope	5%
	soil- Memphis Silty Loam	
	cover- Lawn 82.7%, water 17.3%	
c.	Runoff PMF (AMC II)	24.71 inches
d.	Runoff ½ PMF (AMC II)	12.36 inches
e.	Runoff P <sub>100</sub> (AMC III)	3.82 inches

## A.3 OUTLET STRUCTURES

A.3.1 Drawdown Facilities - None

A.3.2 Service Spillway - Concrete chute to 30 inch pipe approximately 12 feet long and approximately ten feet landward from concrete sill control of emergency spillway.

a.	Crest elevation	339.6 feet
b.	Opening Width	5.3 feet
c.	Maximum discharge capacity	52.5 cfs

A.3.3 Emergency Spillway (Right abutment)

a.	Crest elevation	339.8 feet
b.	Side slope (left)	1V on 6H
c.	Side slope (right)	1V on 6H
d.	Depth	2.8 feet
e.	Bottom width	8.8 feet
f.	Maximum capacity	100 cfs

A.3.4 Emergency Spillway (left abutment) None

#### A.4 HISTORICAL DATA

A.4.1 Construction Date - Original dam approximately 50 years ago. Rebuilt when subdivided during 70's.

A.4.2 Designer - Unknown

A.4.3 Builder - Unknown

A.4.4 Owner - Colonial Country Club and adjacent property owners

A.4.5 Previous Inspection - 8/14/80

A.4.6 Seismic Zone - 3

#### A.5 DOWNSTREAM HAZARD DATA

A.5.1 Downstream Hazard Potential Classification

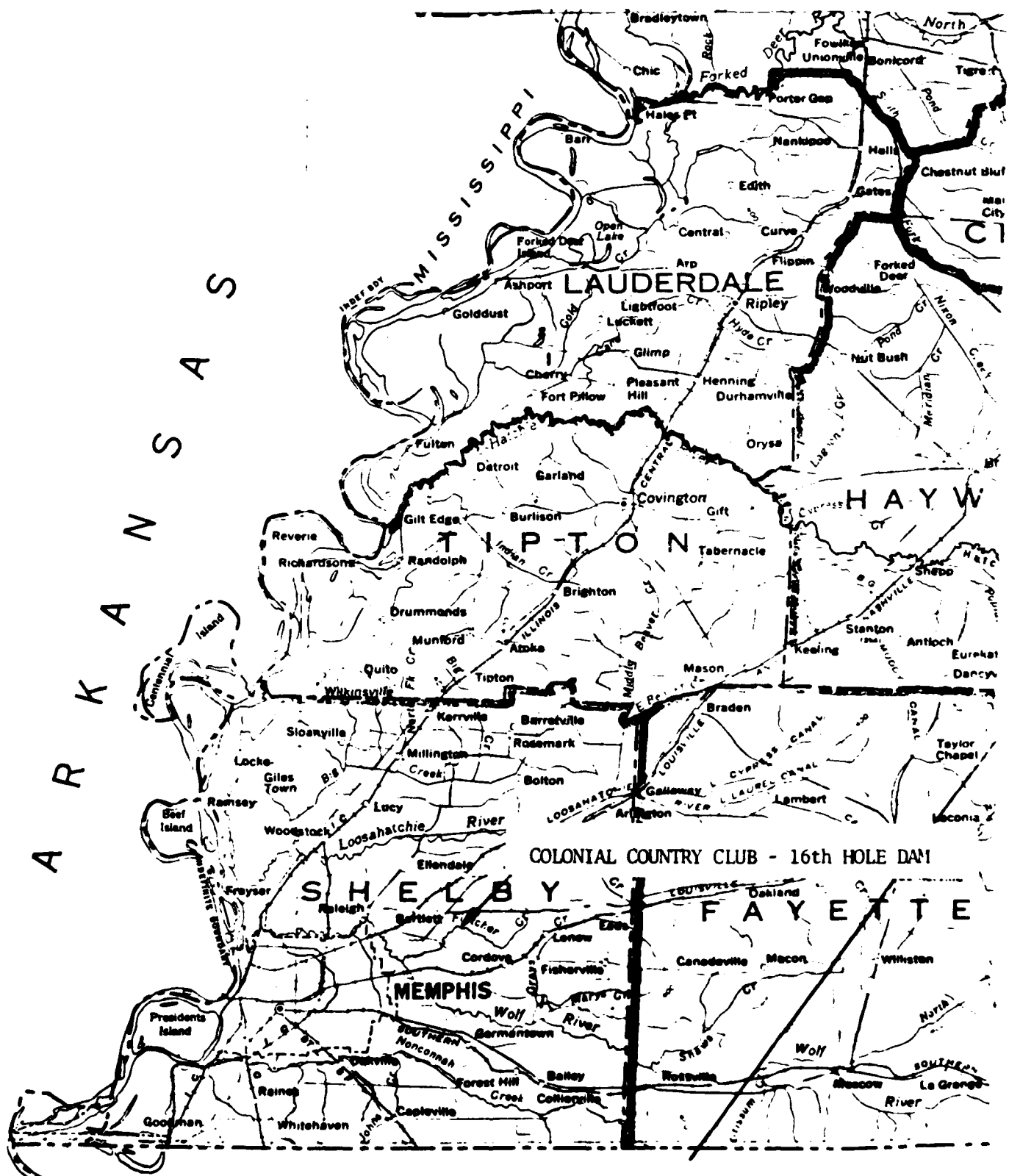
a.	Corps of Engineers	High
b.	State of Tennessee	I

A.5.2 Persons in Probable Flood Path 60 + persons

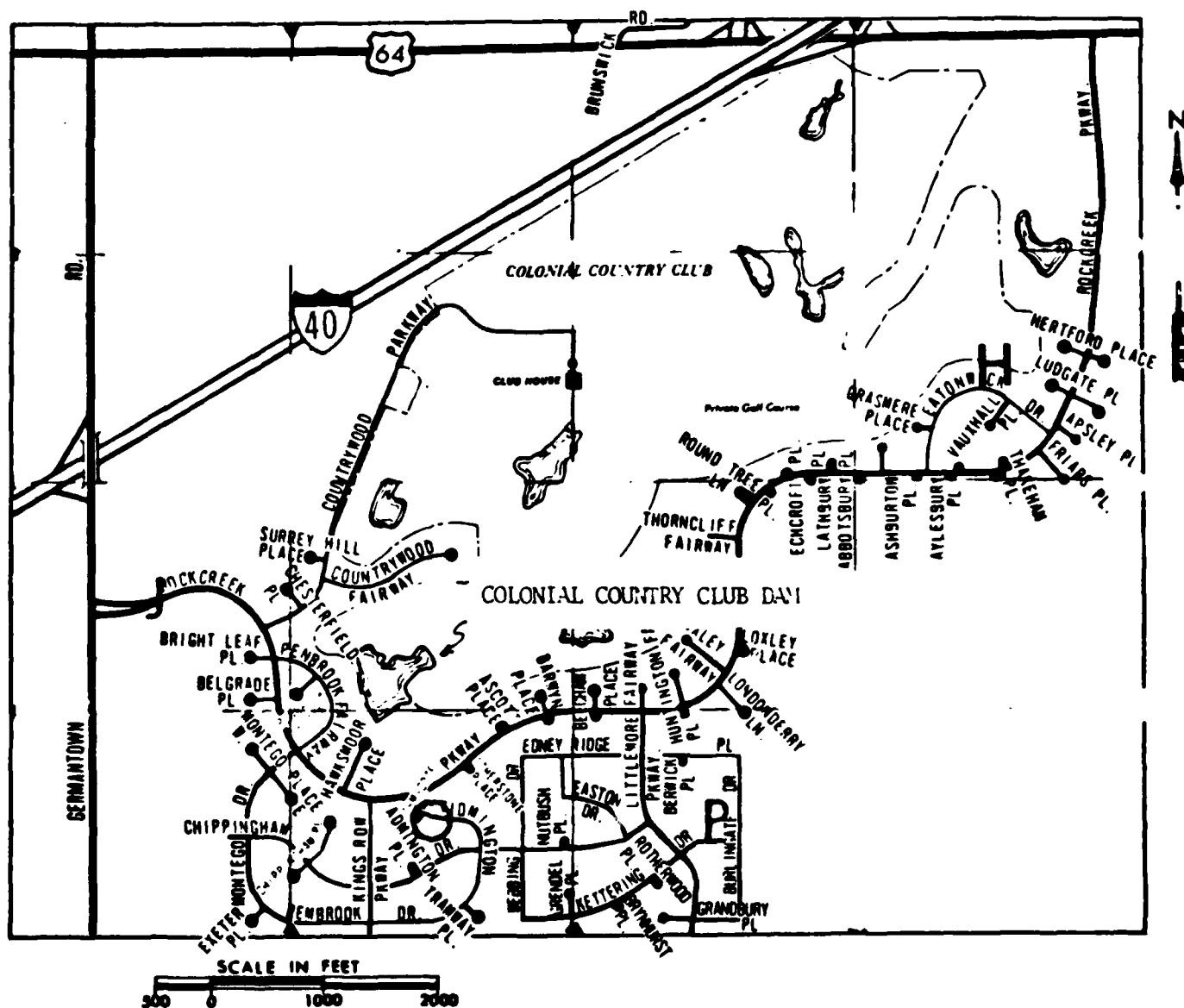
A.5.3 Downstream Property 10-15 Homes,  
Rock Creek Parkway  
& other minor streets.

A.5.4 Warning Systems None

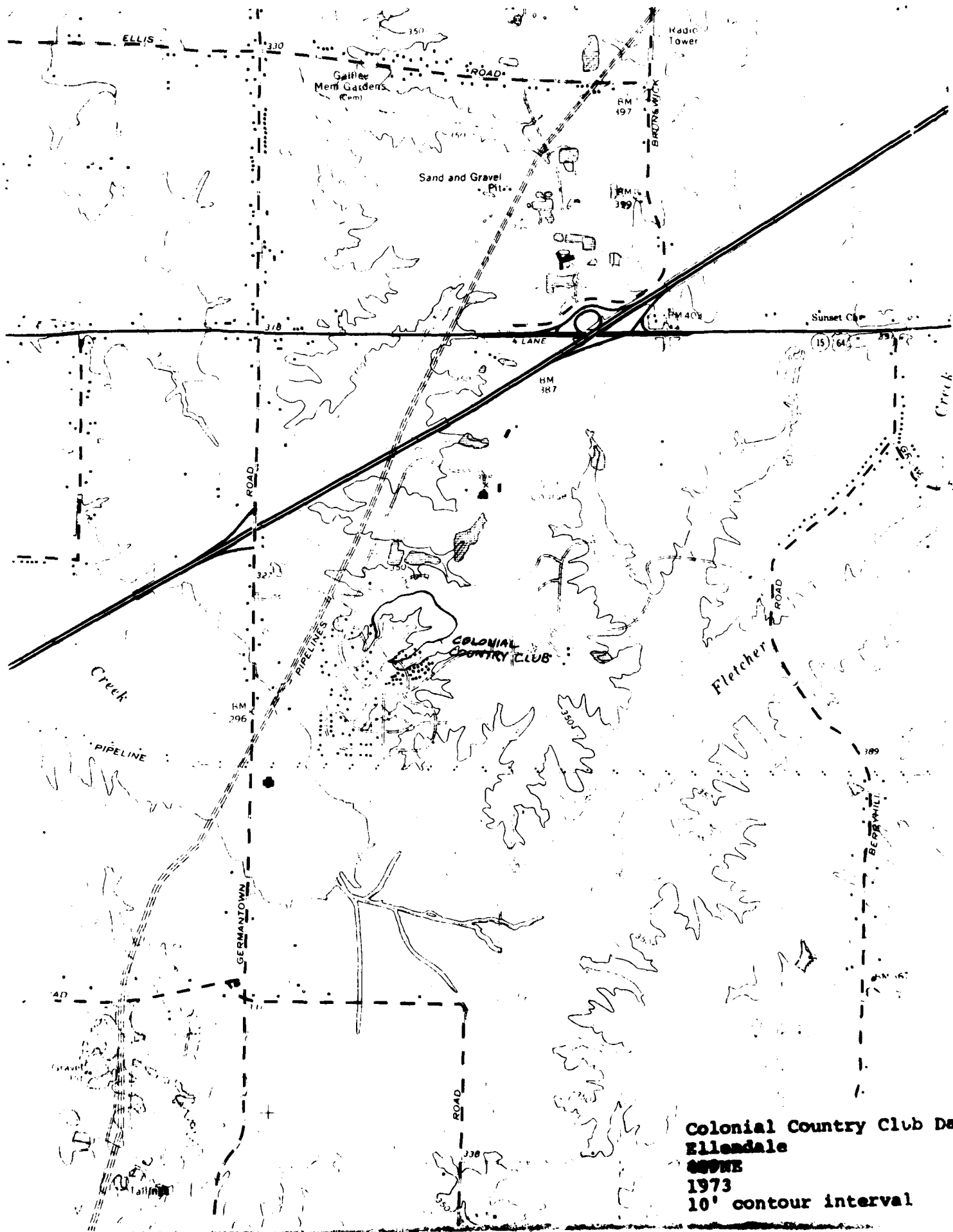
APPENDIX B  
SKETCHES AND LOCATION MAPS



LOCATION MAP  
COLONIAL COUNTRY CLUB - 16th HOLE DAM



SITE MAP  
COLONIAL COUNTRY CLUB - 16th HOLE DAY





RockCreek Parkway

Pembrook Fairway

Hawksmoor Place

Junction Box  
Inlet

30" Pipe

Spillway

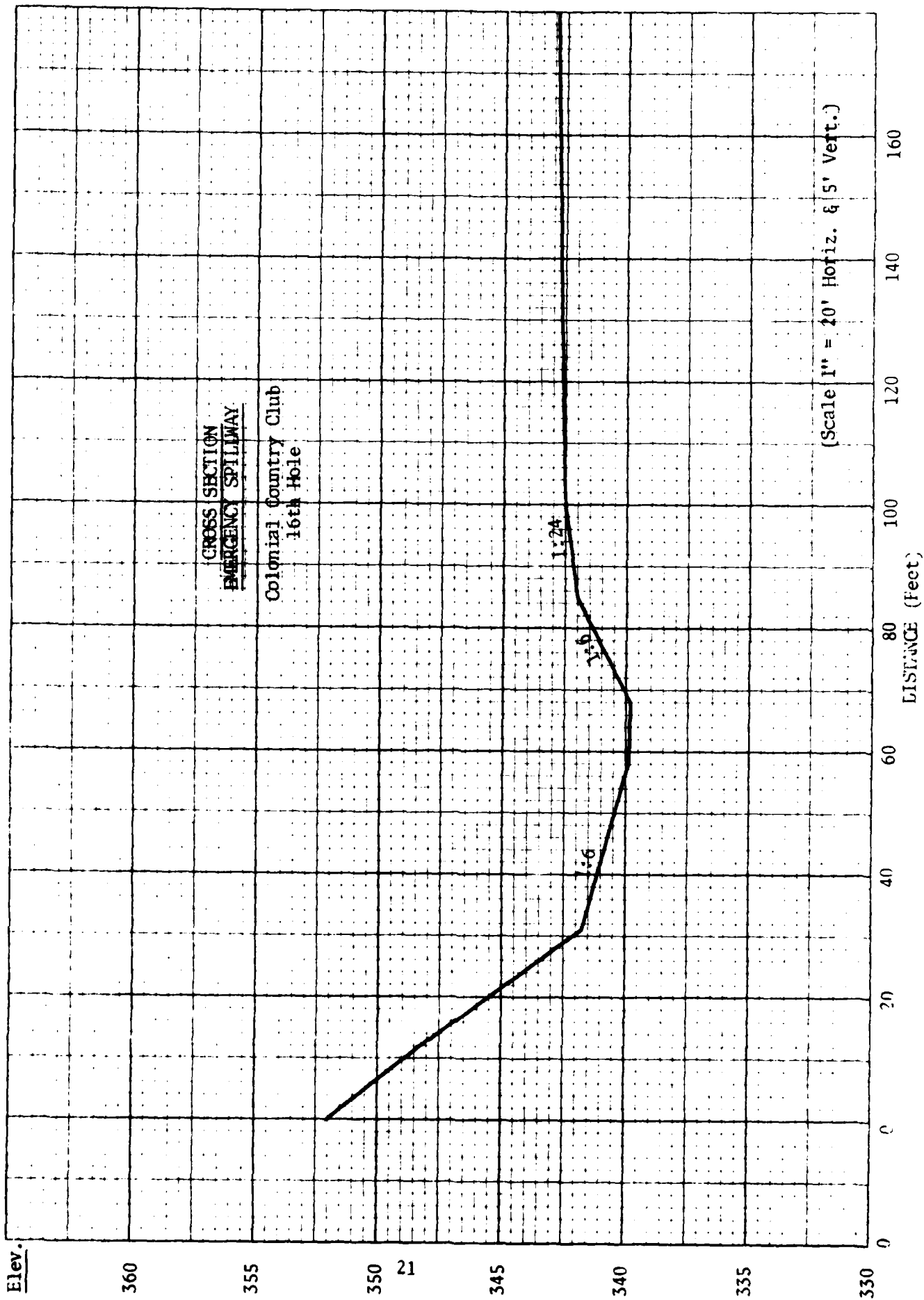
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LAKE

4+41

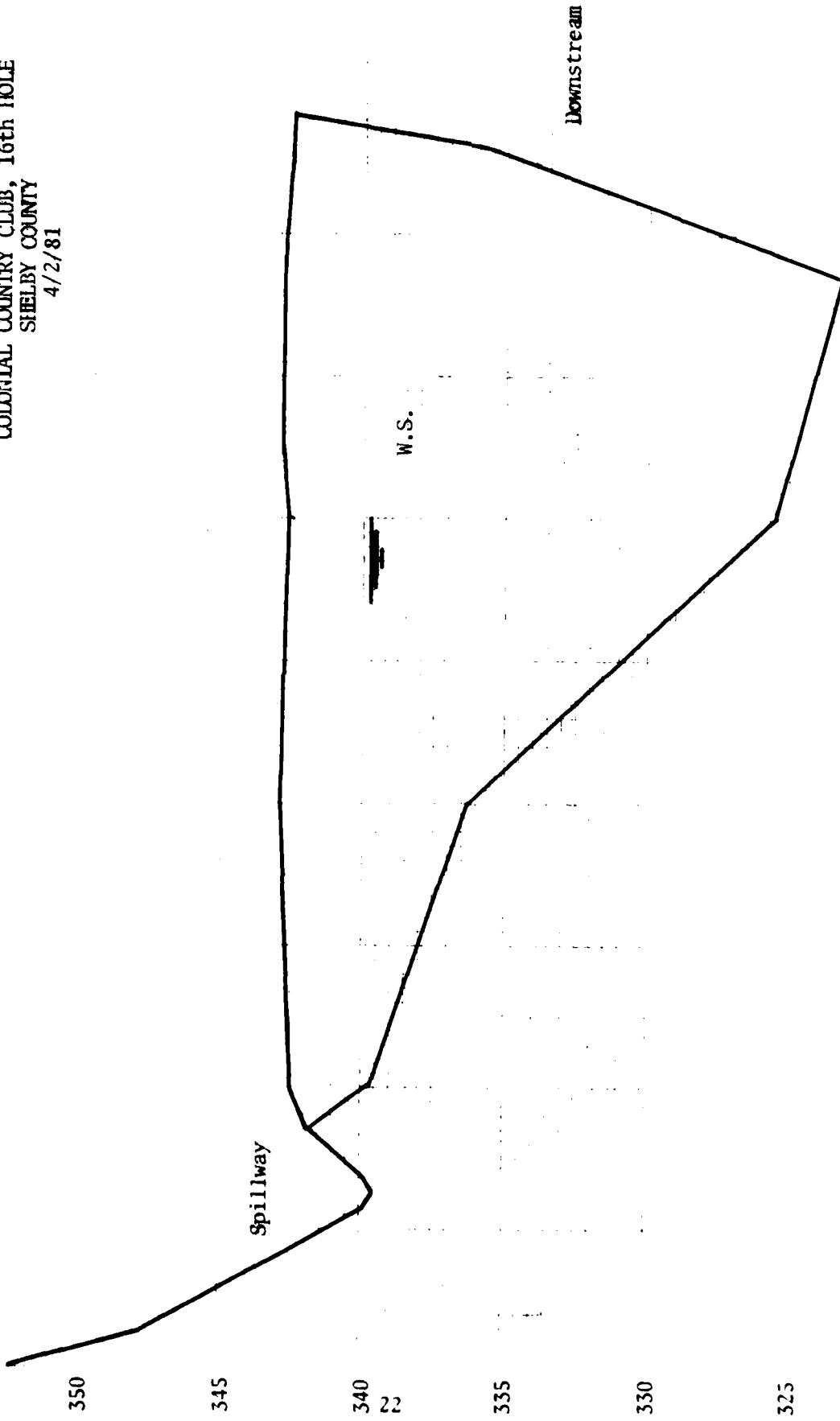
COLONIAL COUNTRY CLUB  
16th Hole  
Shelby County

PLAN  
(Not to Scale)



Elev.  
(feet)

COLONIAL COUNTRY CLUB, 16th HOLE  
SHELBY COUNTY  
4/2/81



DAM PROFILE

1+00

2+00

3+00

4+00

5+00

-Invert outfall pipe

lev.  
(feet)

350

345

340

23

335

330

325

E

W.S. 339.7'  
4/2/81

1.0 3.0 3.4 1.0

GROSS SECTION  
STATION 2+00

Colonial Country Club  
16th Hole

(Scale 1" = 10' Horz. & 5' Vert.)

40

30

20

10

0

10

20

30

40

DISTANCE (FEET)

Elev.  
(Feet)

350

345

340 W.S. 339.7'  
4/2/81

24

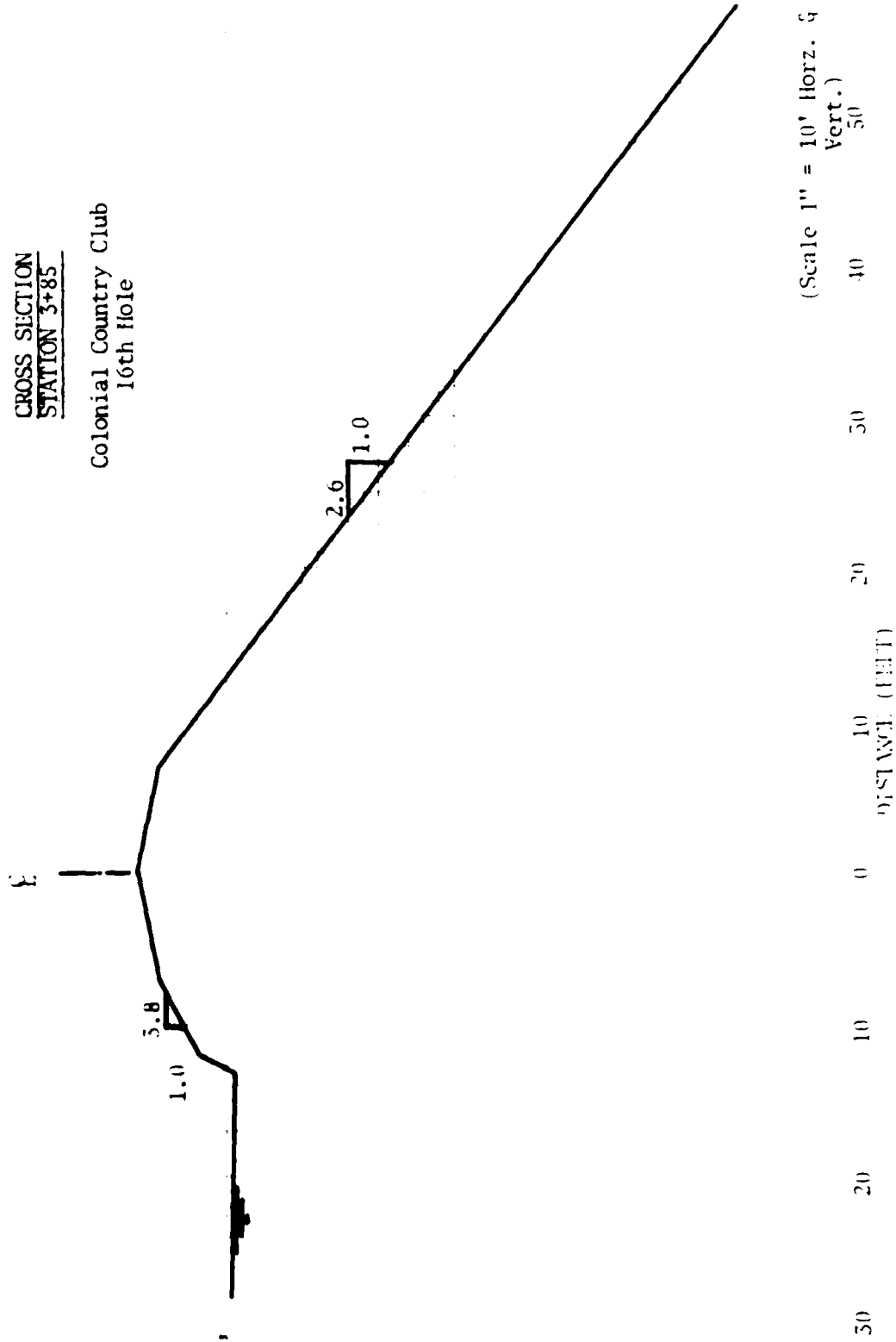
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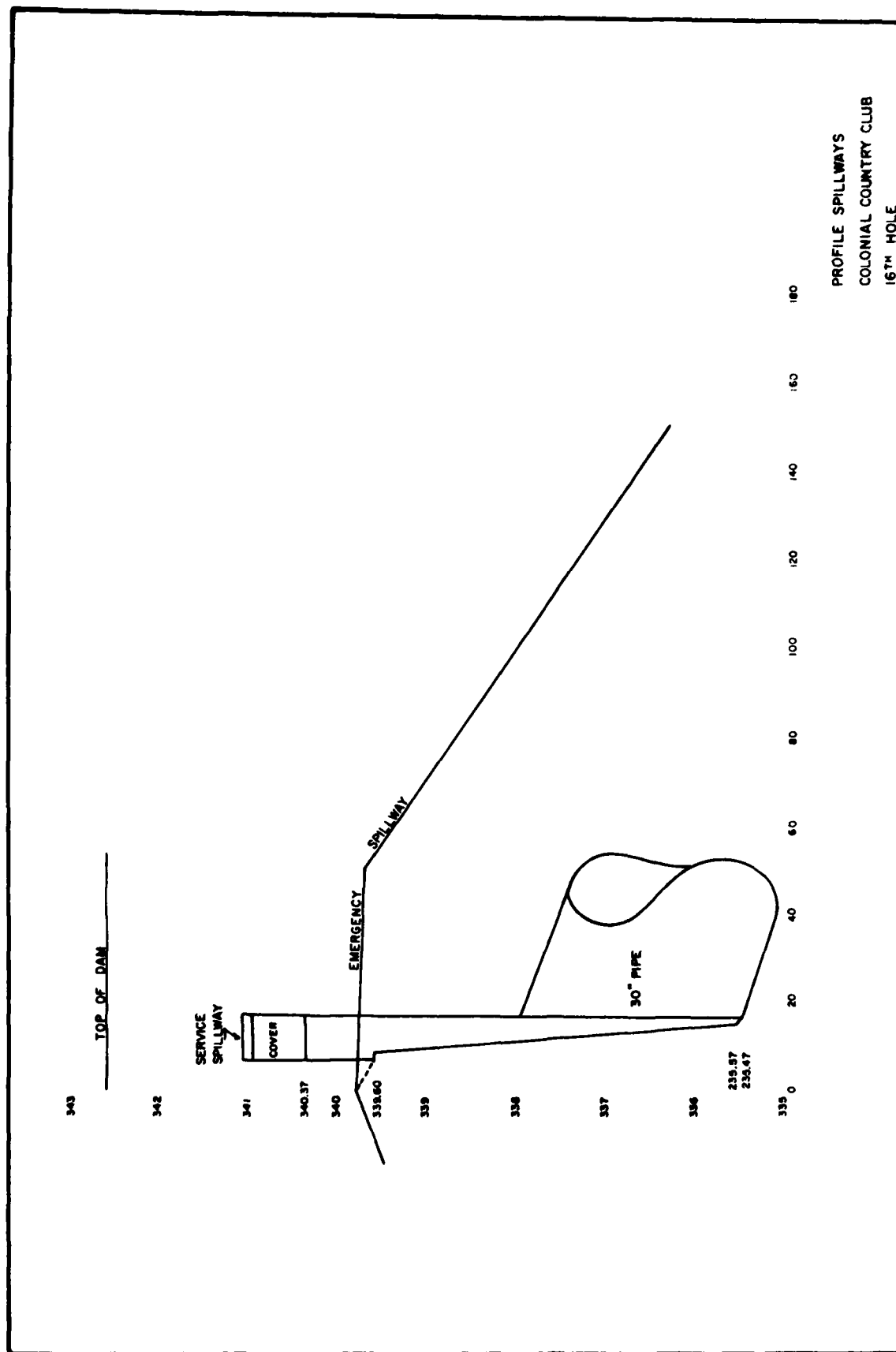
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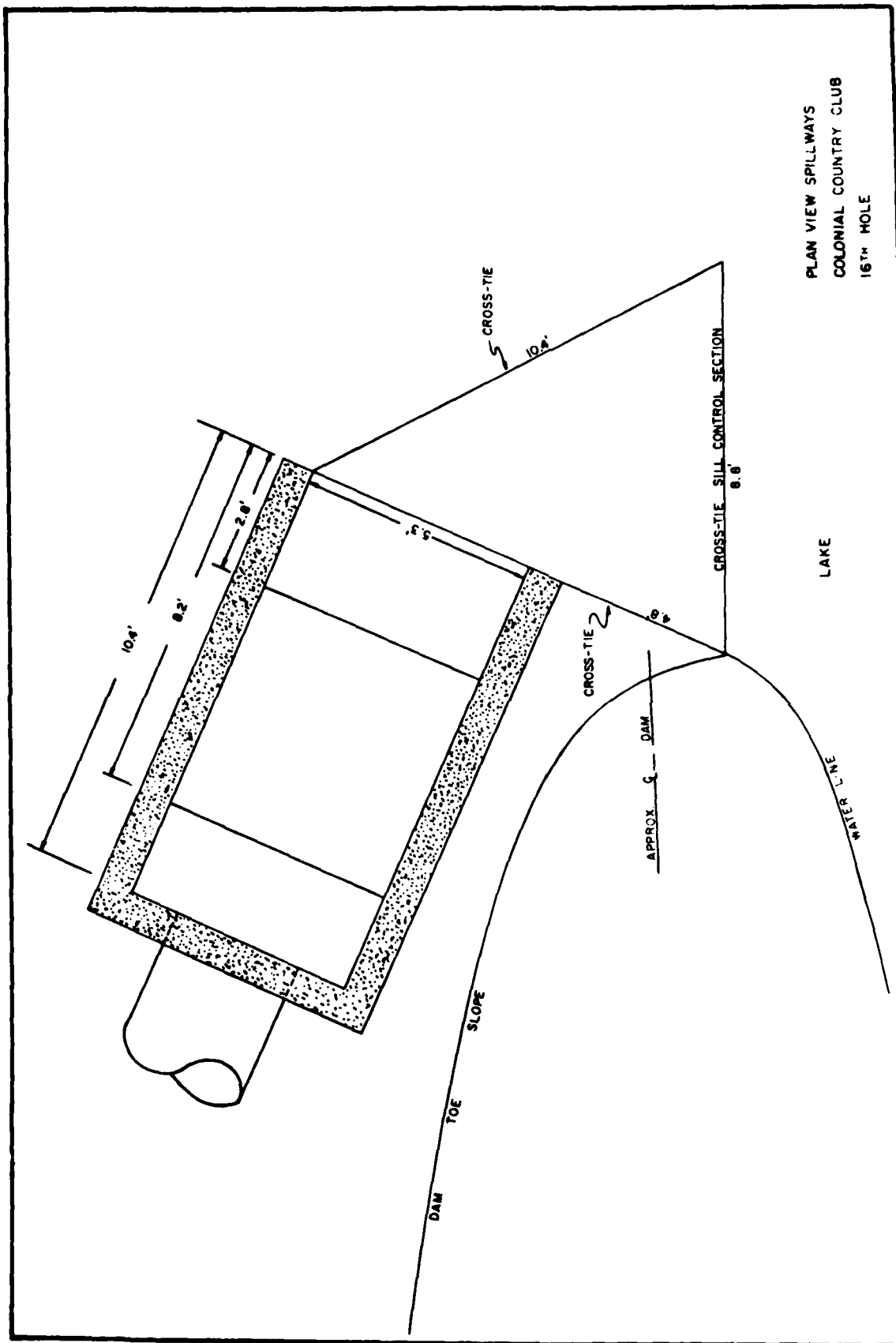
325

320 40

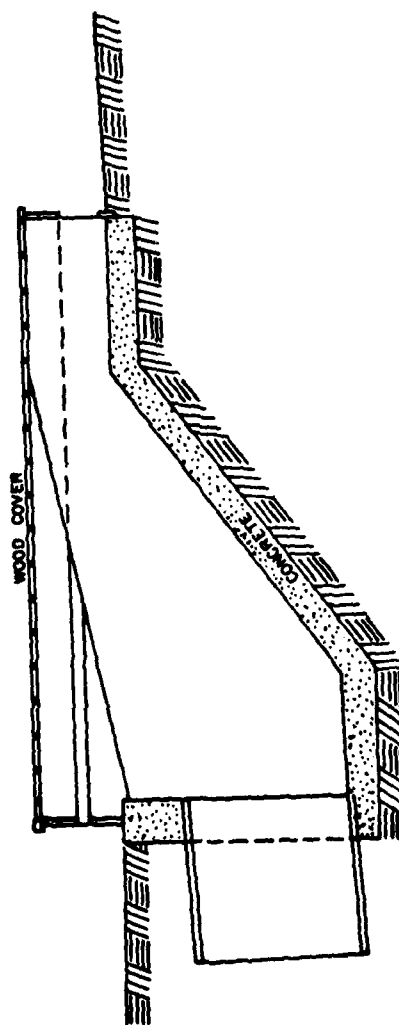
CROSS SECTION  
STATION 3+85  
Colonial Country Club  
16th Hole







PLAN VIEW SPILLWAYS  
 COLONIAL COUNTRY CLUB  
 16TH HOLE



DETAIL "SERVICE" SPILLWAY  
 COLONIAL COUNTRY CLUB  
 16TH HOLE



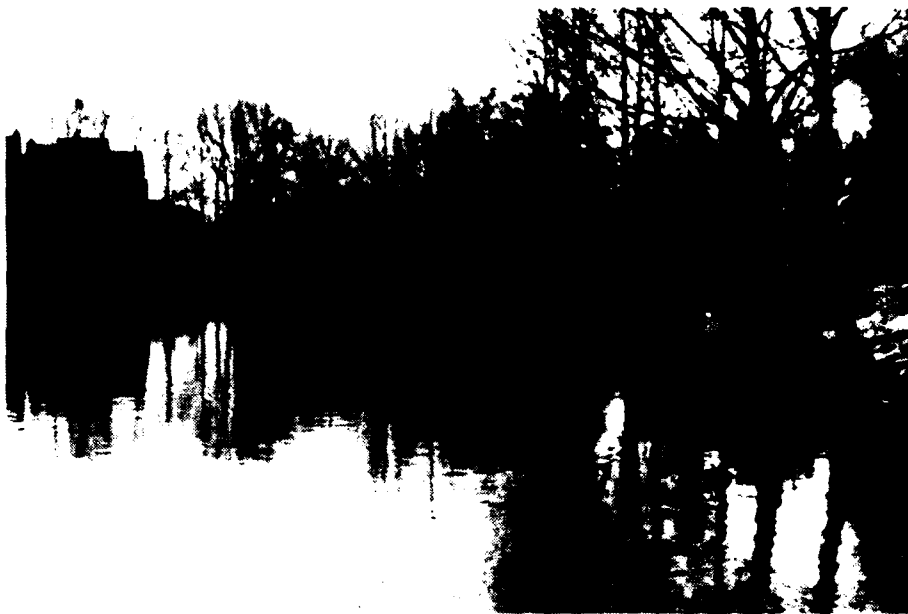
APPENDIX C  
PHOTOGRAPHIC RECORD



1. Top of Colonial Country Club - 16th Hole Dam from right abutment.



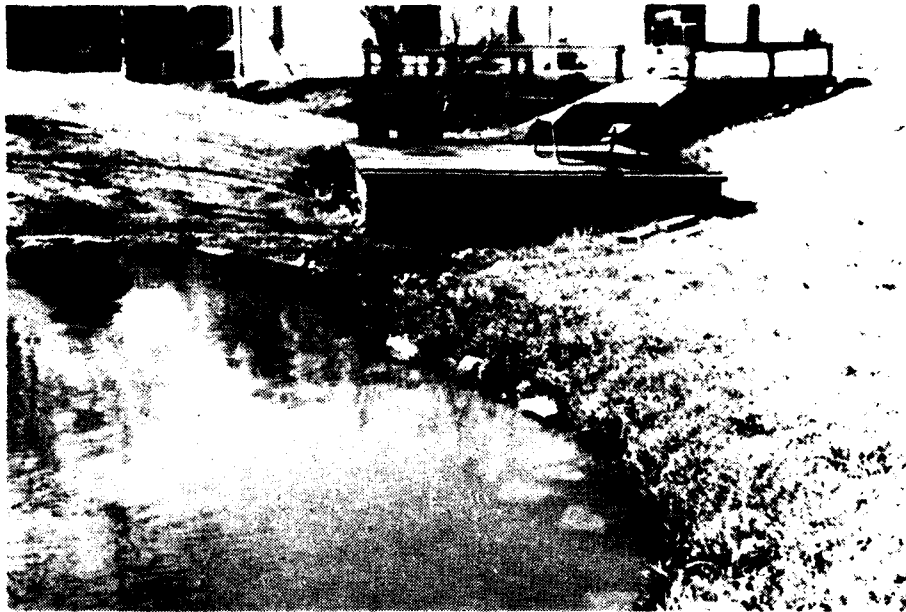
2. Left abutment of Colonial Country Club - 16th Hole Dam. Note house located in abutment.



3. Upstream slope Colonial Country Club - 16th Hole Dam.



4. Backslope Colonial Country Club - 16th Hole Dam. Benched area in foreground is buried telephone cable.



5. Control section of emergency spillway and service spillway for Colonial Country Club - 16th Hole Dam. Note location of house.



6. Outfall swale for emergency spillway approximately 50 feet from control section.



7. Outfall swale for emergency spillway immediately downstream from Photo No. 6.



8. Inlet and junction box at toe of downstream slope for outfall pipe of service spillway and storm drain for subdivision.

APPENDIX D  
INSPECTION TEAM TRIP REPORTS

TRIP REPORT  
COLONIAL COUNTRY CLUB - 16th HOLE  
SHELBY COUNTY, TENNESSEE

GENERAL ENGINEERING OBSERVATIONS  
April 2, 1981

GENERAL. An engineering inspection of the Colonial Country Club - 16th Hole Dam located in Shelby County, Tennessee was made with Dr. Fred H. Kellogg, Kellogg Engineering, George Moore, and David Roe of the Tennessee Division of Water Resources on April 2, 1981.

The weather was fair and the temperatures were in the mid 70's. Wind was estimated at 10 m.p.h. with gusts up to 15 m.p.h. The lake level was at the elevation of the invert of the emergency spillway.

EMBANKMENT. The crest of the embankment has a straight alignment with a southeast-northwest orientation and the dam appears to be made from compacted earth fill with a top width varying from ten feet to fifteen feet in width. The crest of the dam is in fair condition. A few depressions were noted probably caused by maintenance vehicles. No excessive erosion was noticed on the crest of the dam. No longitudinal surface cracks were observed. No transverse surface cracks were observed. The Colonial Country Club owns the lake and crest of the dam plus a small portion of the downstream slope. The remaining portion of the downstream slope is subdivided among the adjacent property owners. The upstream slope has several small trees all under 6 inches in diameter and multiflora

rose bushes scattered along the upstream slope. Most of the upstream slope is vertical, caused by wave erosion. Slope protection is afforded by light riprap on the west third of the dam. The condition of this riprap is fair, but wave action is causing deterioration. The riprap consists of small pieces of broken concrete. The slope protection is fair on that portion of the slope protected by the riprap, no gradation of the riprap was observed. Two thirds of the downstream slope is covered by trees up to six inches in diameter with many saplings and small bushes. Several small benches were observed on this slope. A telephone service cable has been installed in a trench approximately ten feet below the crest. This trench runs the entire length of the dam and also has a lateral cable that was installed running down the backslope. The entire length of the trench has subsided and is now causing an erosion problem. No other surface cracks or evidence of heaving was noted. Holes were all along the telephone trench. A boring, made during the inspection at the toe of the dam, found water at approximately the three foot depth. A tight, dry clay was found above that depth. No toe drain system was observed for this dam. The west third of the slope is being maintained as lawn by the adjoining property owners and is in excellent condition. There was no erosion of contact of the embankment with the abutment from surface water runoff, upstream or downstream. No springs or indication of seepage was noted.

The area downstream of the embankment is a fully developed urban subdivision with drainage improvements. There is no evidence noted of piping, boils, or seepage.



The spillway is a service/emergency combination found at the west abutment of the dam. The service spillway entrance is approximately 10 feet landward from the control section of the emergency spillway. We were unable to remove the wood cover of the structure to observe its condition or the size of outfall pipe being used at this point. The outside appearance of the structure was good but the cover makes the structure extremely susceptible to stoppage by floating debris. The front opening of the structure is approximately 8 feet wide and about 12 inches in height. The sides and back are enclosed in such a way as to make the movement of water through this portion of the structure very difficult. From observation through the throat of this structure, it appears that the water is ramped down to the pipe at approximately a 45 to 60 degree angle and at that point enters a 30 inch concrete pipe. It is estimated that the service spillway would take probably 10 percent of the flow passing through the emergency spillway. The remaining flow would pass down the west abutment through a swale close to the foundations of two dwellings. See Photograph 6. The emergency spillway is vegetated earth, and the control section is protected by broken concrete riprap at the water line. The portion of the flow intercepted by the service structure is carried downstream to a junction box located at approximately Station 3 + 80. The pipe makes approximately a 60 degree bend within the junction box and the pipe leaving the junction box is estimated to be a 42 inch concrete pipe. The service spillway pipe is partially exposed for about 50 feet near its entrance into the junction box.

CONCLUSIONS. The Colonial Country Club - 16th Hole Dam poses a high hazard to the downstream development. The original dam was built as a farm pond

approximately 50 years ago. The dam has been altered for the subdivision development, although the type of alterations is unknown. The location of the spillway with an earth waterway through the backyards except that small portion intercepted by the inlet poses considerable hazard for the homes located along this waterway in the event of the 100 year or larger storms.

RECOMMENDATIONS. I would recommend, first, that the trees be removed from both the upstream and downstream slopes along with the other debris before the trees grow to be large and cause additional problems. Second, the telephone line trench should be repaired with a compacted fill or with a soil cement fill so as to prevent further erosion in these trenches. Third, an engineering study be made to determine the feasibility of re-locating the emergency spillway and service facilities so that the house sites that presently adjoin this facility would be protected.

*Wm. E. Bush*  
William E. Bush, P.E., Director  
Civil and Water Resource Engineering  
TN License No. 4177

COLONIAL COUNTRY CLUB  
16th HOLE DAM  
INSPECTION REPORT

INTRODUCTION. This is an earth dam located on a tributary of Fletcher Creek, in Countrywood subdivision, about seven miles north of Germantown, Tennessee. The dam has a maximum height of 25 feet. The reservoir surface is 23.1 feet above the bottom of the manhole that discharges into the storm drain system. The dam is oriented east and west, with the pool on the north side. It is over 50 years old according to one of the residents living just downstream. The dam was inspected on 2 April 1981.

GEOLOGY AND SOIL PROFILE. The dam was constructed of a silty clay derived from the loess (wind-deposited silty materials) that covers most of Shelby County. The fill belongs to group "CL" in the Unified Classification System (See Figure 1), with medium plasticity and very low permeability. It appears to be well compacted. The natural soils are made up of loess in the abutments and redeposited loess and alluvium in the valley. The redeposited loess is a bluish-gray silt belonging to group "ML" in the Unified System. This is livery when wet. It is probably less than ten feet thick and rests on loess. Below the loess, and about 15 feet below the surface at the bottom of the valley, is a terrace deposit (Lafayette Formation) consisting of clayey sands and gravels (groups "SC" and "GC").

SPILLWAY. The spillway is located just beyond the west abutment. The emergency spillway is about three feet below the crest. It has a good grass cover, with rock or concrete fragments protecting it upstream, and a wooden beam at its crest. It flows south, then turns eastward, roughly parallel to the toe of

the dam. Water overtopping it eventually reaches the storm drain system of the subdivision. A 30" concrete pipe spillway is fed by a drop inlet with a concrete chute just south of the crest of the emergency spillway. No protection from accumulation of debris was furnished. The top of the 30" discharge pipe protrudes above the surface along the outfall of the spillway. A small channel, about 8" wide and a few inches deep has washed just to the north of this pipe. The pipe discharges into a manhole near the base of the east abutment. The elevation of the top of the manhole is 320.22.

CREST. The crest is at elevation 341.6. It is 11 feet wide, sloping slightly toward the reservoir. It has a good grass cover, and no longitudinal or transverse cracks. There was very slight erosion near a few borrows apparently made by dogs, and along some wheel tracks.

UPSTREAM SLOPE. The upstream slopes are reported in the State summary to be 1V on 2.3H, but since the freeboard was only about three feet, and the slope was eroded by wave wash for the entire length of the dam, this is difficult to verify. Approximately the westernmost third of the slope has been protected by concrete blocks and fragments. These may have been placed after a terrace was washed in the slope just below the water line. A line of small trees grows at or slightly above the water line. These afford some protection against wave wash, but may become a hazard after they grow to considerable size. Similar washing and terracing appear along the east and west reservoir banks for a considerable distance upstream. The washing has cut vertical faces a foot or two high, but no signs of sloughing or sliding were seen. Several crayfish and small boring animal holes were found near the water line.

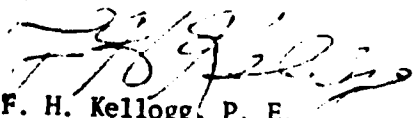
DOWNSTREAM SLOPE. The downstream slope is 1V to 2.8H. Near the spillway there is a 36 inch tree and several smaller trees (three to six inches). Farther east, the trees had diameters up to eight inches. No signs of sliding or seepage were seen. An auger hole, drilled at the downstream toe and at the highest part of the dam, showed water three feet deep, below group "CL" elluvium and at the top of the blue silt (group "ML") that apparently marks the stream channel. A telephone cable has been buried along the entire length of the slope, about eight feet below the crest. A loose backfill in this trench has settled, trapping water which, in overtopping the trench, has caused erosion that could eventually become serious. Where wires come down the slope, rills have formed which are two to three feet deep in one place near the east abutment. At Station 3+00, a 12" x 6" hole has washed straight down, apparently on the cable line, to a depth of about 12 inches. West of here, the soil is very soft along the cable line, and a slight bench is located about five feet above the toe. Another slight bench was found at about Station 2 + 00. Slumping was noted along the cable line to about Station 0 + 50. A jug which has formed about a foot above the cable line was about 18 inches deep.

ABUTMENTS. No abutment-fill contact erosion was seen. Some erosion, apparently along the cable line, was noted on both abutments. A house is located at the east abutment, over the spillway discharge. Several houses are located at the foot of the west abutment.

RECOMMENDATIONS. The entire cable line should be backfilled with clay backfill, removing the loose material. The backfill should be tamped with a

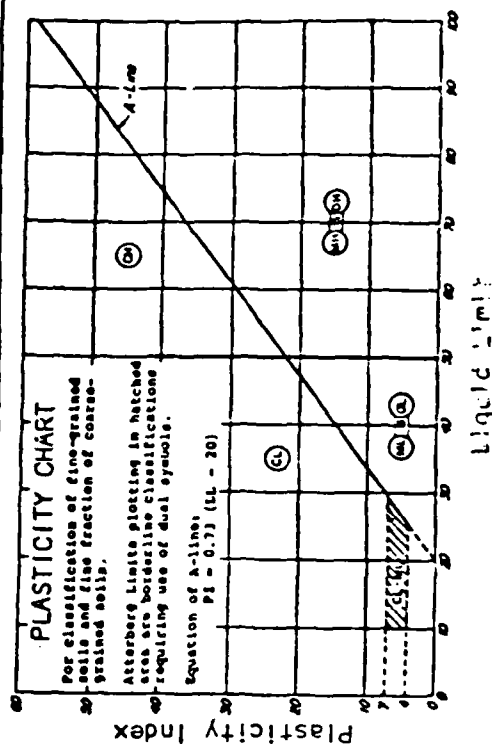
pneumatic hand tamper or gasoline hammer. Where holes over six inches deep are found, the backfill should contain about ten percent by weight of Portland cement and brought to within three or four percent of optimum moisture. The trees on both slopes should be cut flush with the ground before they become large enough to constitute a hazard.

Report Submitted 4/6/81

  
F. H. Kellogg, P. E.

MAJOR DIVISIONS	GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	Clean Gravels
		GW
		GP
		GM
	SANDS More than 50% of coarse fraction passes No. 4 sieve	GC
		SW
		SP
		SM
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	SANDS WITH FINES	SC
		ML
		CL
		OL
	SILTS AND CLAYS Liquid limit 50% or less	MH
		CH
		OH
		PT

CLASSIFICATION CRITERIA		
Classification on basis of percentage of fines Less than 5% Pass No. 200 sieve 5% to 12% Pass No. 200 sieve More than 12% Pass No. 200 sieve GM, GC, SM, SC GW, GP, SW, SP Borderline classification requiring use of dual symbols	$C_u = D_{60}/D_{10}$ Greater than 4	
	$C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
	Not meeting both criteria for GW	
	Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
	$C_u = D_{60}/D_{10}$ Greater than 6	
	$C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
	Not meeting both criteria for SW	
	Atterberg limits plot below "A" line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
	Atterberg limits plot above "A" line and plasticity index greater than 7	



SOIL CLASSIFICATION CHART - ASTM D2487

\* Based on the material passing the 3-in (75 mm) sieve

APPENDIX E  
HYDRAULIC AND HYDROLOGIC DATA



## HYDRAULICS AND HYDROLOGIC CALCULATIONS

Colonial Country Club - 16th Hole Dam is located in Shelby County, Tennessee. The present land use is estimated to be 82.7 percent lawn, and 17.3 percent water. The soil is predominantly Memphis silty loam and is classified as a "B" soil. The runoff curve number was calculated to be 68 AMC II.

The Colonial Country Club - 16th Hole Dam is a small size, high hazard potential dam. As such it is required to pass a  $\frac{1}{2}$  PMF without overtopping. Using the U.S. Weather Service TP-40, the 6-hour PMP was estimated to be 29.7 inches yielding 24.71 inches runoff (RCN 68 AMC II). The  $\frac{1}{2}$  PMF which is derived from the Probable Maximum Precipitation, was routed with a 12.36 inch runoff (RCN 68 AMC II).

The total inflow into the reservoir is about 26.37 acre-feet with a maximum peak of 261 cfs. Colonial reservoir has a maximum storage from the crest of the service spillway to the top of the dam of 15.7 acre-feet and a maximum spillway discharge rate of 100 cfs. The impoundment is sufficient to safely pass the  $\frac{1}{2}$  PMF. However, the full PMF will overtop the dam one foot for approximately two hours.

The 6-hour, 100-year flood containing 5.6 inches precipitation was routed through the dam using a RCN of 84 (AMC III). This produced a runoff of 3.82 inches and a routed peak discharge of 16.7 cfs. Colonial Dam contained the storm with flows of 0.8 feet in the spillway and a freeboard of 2.0 feet.

The 1-10 day, 100-year storm was not found applicable for this dam since the service spillway entrance is located approximately seven feet landward from from the control section of the emergency spillway.

The inflow hydrograph was calculated by methods contained in Section 4, Chapter 21, of the SCS National Engineering Handbook. Weir constants in the formula  $Q=CLH^{3/2}$  were found in King and Brater "Handbook of Hydraulics", fifth edition. The routing equation used was:

$$I_1 + I_2 + \left( \frac{2S_1}{\Delta t} - O_1 \right) = \left( \frac{2S_2}{\Delta t} + O_2 \right) .$$

Basic Engineering Data was obtained from the following sources: Engineering surveys of the impoundment structure; U.S. Geologic Survey Topographic Maps; Aerial photographs; USDA Soil Conservation Service Soil Survey Maps; Rainfall Data and Hazard Classification from the Tennessee Division of Water Resources.

# HYDRAULIC AND HYDROLOGIC SUMMARY

Frequency of Occurrence	Duration	Antecedent Moisture Condition	
		II	III
100-year	6-hour	Will Pass	Will Pass
100-year	10-day		
$\frac{1}{2}$ PMF <sup>1</sup>	6-hour	Will Pass	Will Pass
PMF	6-hour	Will Overtop Dam 1 foot for approximately 2 hours	Will Overtop Dam 1.2 feet for approximately 2.3 hours

<sup>1</sup>Probable Maximum Flood

CFS

COLONIAL COUNTRY CLUB - 16th HOLE  
HYDROGRAPH  
FULL PMP (AMC II)

600

500

400

47

300

200

100

0

Inflow

Outflow

TIME (Hours)

7

6

5

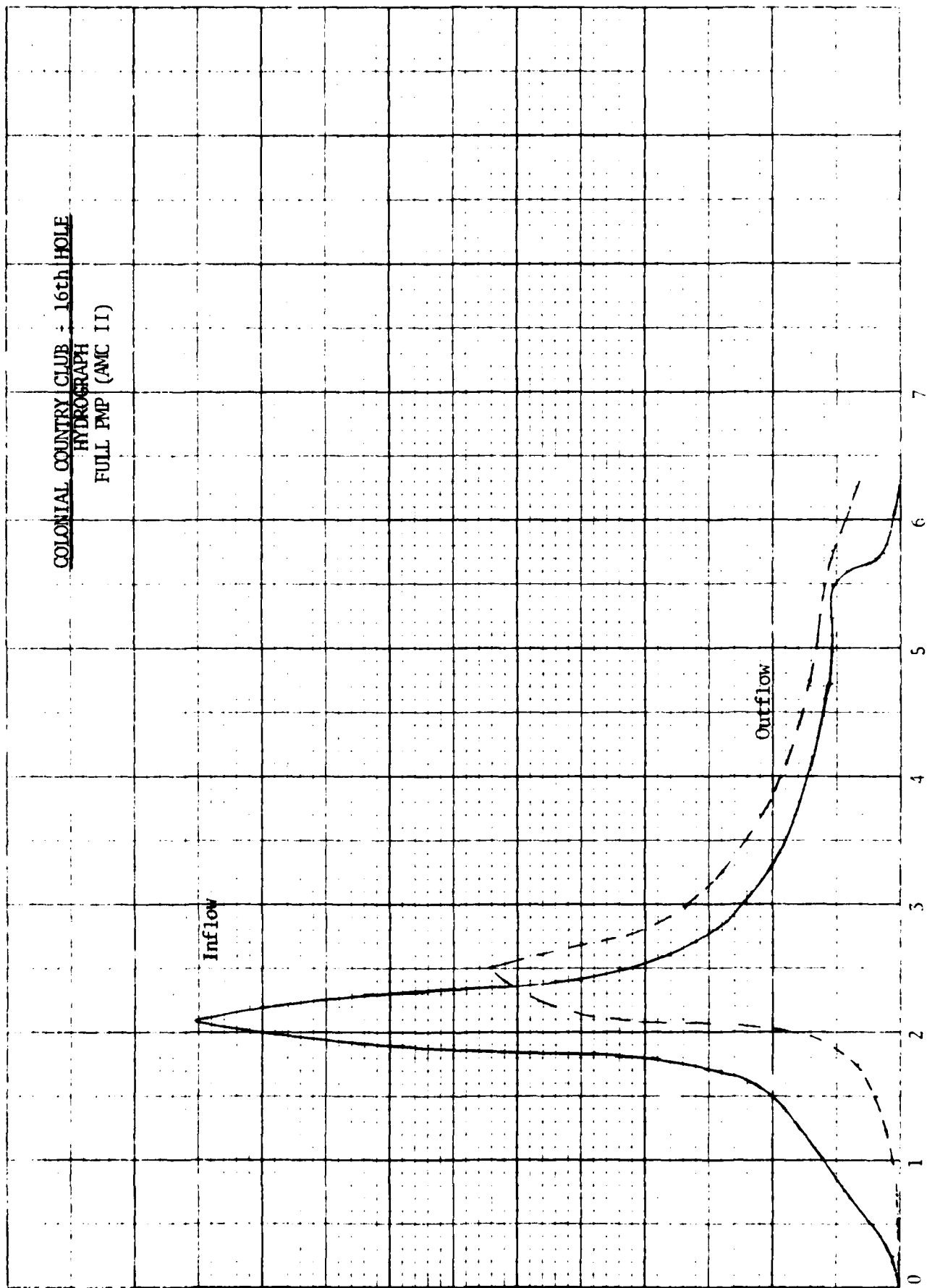
4

3

2

1

0



\*\*\*\*\*  
NAME OF GUN ACCELERATOR

STORM=FULL PNF  
TIME INCREMENT IN HOURS = 0.25

TIME	I (CFS)	2S/DT-0	2S/DT+0	O (CFS)
0.00	0.00	0.00	0.00	0.00
0.25	6.00	5.89	6.00	0.00
0.50	25.00	35.61	36.83	0.34
0.75	40.00	95.76	100.61	2.40
1.00	60.00	183.93	195.73	5.89
1.25	80.00	300.95	323.93	11.51
1.50	100.00	441.97	480.93	19.49
1.75	170.00	646.27	711.97	31.51
2.00	551.00	1210.63	1367.27	78.35
2.25	450.00	1642.96	2211.63	264.00
2.50	210.00	1659.50	2302.93	327.73
2.75	150.00	1588.63	2019.50	215.40
3.00	123.00	1525.13	1860.63	167.75
3.25	105.00	1472.86	1752.13	119.00

3.50	90.00	1427.62	1697.00	129.12
3.75	80.00	1386.95	1597.62	107.2
4.00	70.00	1351.03	1538.90	94.54
4.25	65.00	1318.45	1488.03	84.79
4.50	60.00	1288.92	1443.45	77.27
4.75	56.00	1262.64	1404.92	71.14
5.00	54.00	1240.10	1372.64	66.27
5.25	53.00	1221.96	1347.11	63.57
5.50	50.00	1205.99	1324.95	59.49
5.75	48.00	1163.96	1267.94	52.81
6.00	45.00	1090.16	1171.95	49.90
6.25	40.00	1029.47	1096.15	37.24

\*\*\*\*\*

FULL PMP (AMC II)

HYDROGRAPH COMPUTATION

DATE April 21, 1981

COMPUTED BY BFS

CHECKED BY \_\_\_\_\_

Project Colonial Country Club - 16th  
Hole Dam

DR. AREA 0.04 SQ. MI. STRUCTURE CLASS \_\_\_\_\_

$T_c$  0.20 HR. STORM DURATION 6 HR.

POINT RAINFALL 29.7 IN.

ADJUSTED RAINFALL:

AREAL FACTOR \_\_\_\_\_ IN. \_\_\_\_\_

DURATION FACTOR \_\_\_\_\_ IN. \_\_\_\_\_

RUNOFF CURVE NO. 68

$Q$  24.71 IN.

HYDROGRAPH FAMILY NO. 1

COMPUTED  $T_p$  0.14 HR.

$T_o$  5.55 HR.

$(T_o / T_p)$

COMPUTED 39.64 ; USED 36

REVISED  $T_p$  .154

$q_p = \frac{484A}{REV. T_p} = \underline{125.71}$  CFS.

$(Q \text{ or } q_p) = \underline{3106.4}$  CFS.

$u(COLUMN) = (T_o / T_p) REV. T_p$   $q(COLUMN) = (q_c / q_p) Q \text{ or } q_p$

$Q(COLUMN) = (Q_c / Q) Q$

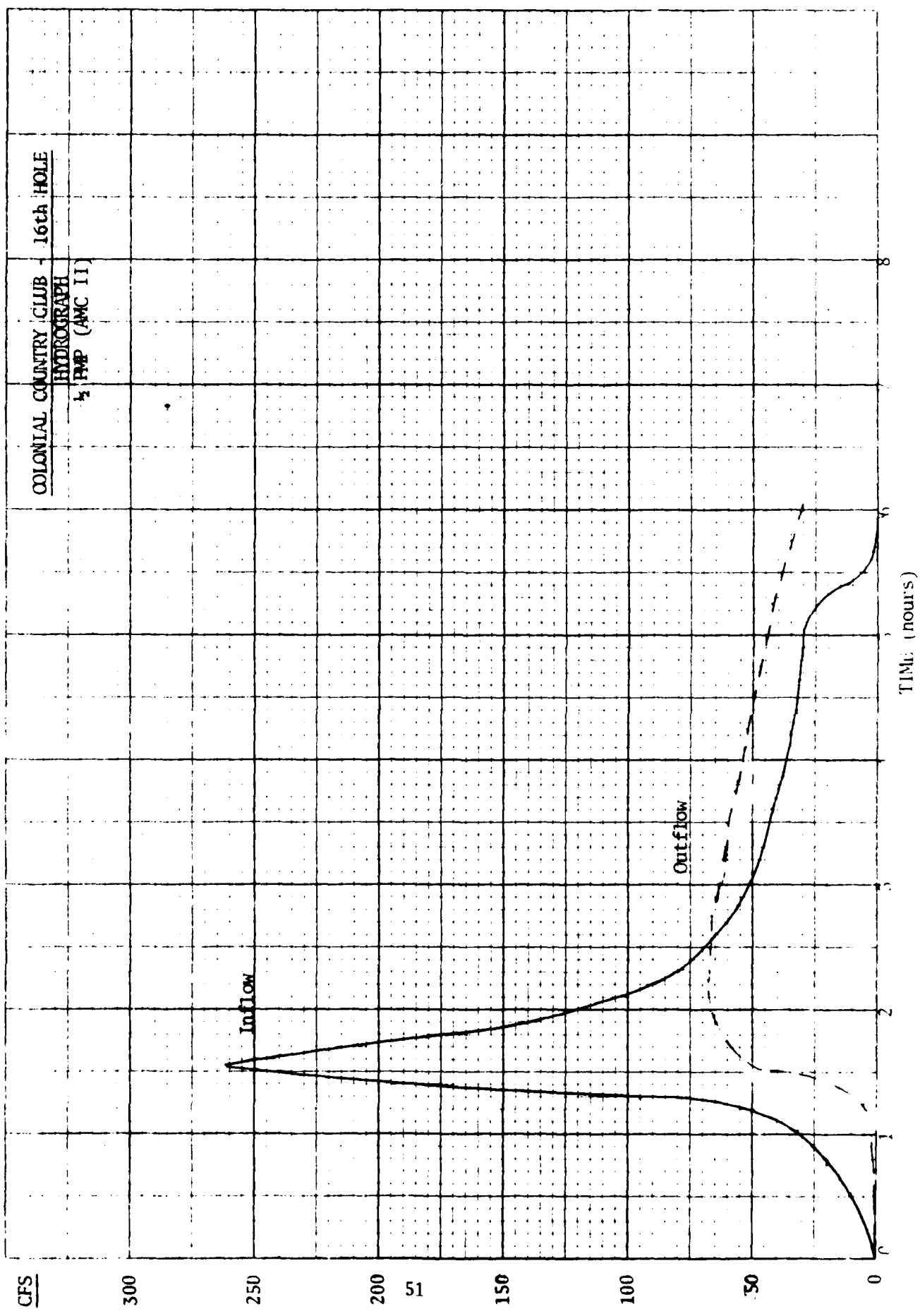
	$t = (T_o / T_p) REV. T_p$	$q = (q_c / q_p) Q \text{ or } q_p$	$Q_c = (Q_c / Q) Q$
	t HOURS	q CFS	Q INCHES
1	0	0	0
2	0.26	6	
3	.52	25	
4	.78	44	
5	1.04	62	
6	1.30	81	
7	1.57	103	
8	1.83	240	
9	2.09	551	
10	2.35	315	
11	2.61	181	
12	2.87	137	
13	3.14	112	
14	3.40	93	
15	3.66	84	
16	3.92	75	
17	4.18	69	
18	4.45	62	
19	4.71	56	
20	4.97	53	
21	5.23	53	
22	5.49	53	
23	5.75	12	
24	6.02	6	
25	6.28	0	
26		2473	
27			
28			
29	check:	<u>0.26 (2473)</u>	
30		<u>0.04 (645)</u>	
31		<u>= 24.92</u>	inches
32			<u>0.6</u>
33			
34			

Whitcomb-Simmonds, Consulting & Associates, Inc.

#21 501 TH BARRSDALE STREET P O BOX 10045 MEMPHIS, TENNESSEE 38104

TELEPHONE 901 274-6488

*Systems Engineers*





\*\*\*\*\*  
NAME OF DAM = COLONITHL

STORNI=L.I.PNF  
TIME INCREMENT (IN HOURS) = 0.25

TIME	I (CFS)	25/DT-0	25/DT+0	Q (CFS)
0.00	0.00	0.00	0.00	0.00
0.25	3.00	2.95	3.04	0.00
0.50	10.00	15.54	15.93	0.21
0.75	20.00	43.85	45.54	0.84
1.00	31.00	90.36	94.81	2.21
1.25	60.00	170.72	181.33	5.20
1.50	261.00	451.58	491.72	20.00
1.75	120.00	812.47	903.59	40.00
2.00	120.00	1002.02	1122.47	60.20
2.25	85.00	1074.34	1207.01	60.00
2.50	60.00	1092.53	1238.34	60.00
2.75	55.00	1085.01	1219.53	60.20
3.00	51.00	1063.23	1194.01	60.00
3.25	46.00	1034.35	1160.20	60.00

3.50	43.00	1092.77	1123.33	60.56
3.75	42.00	970.53	1085.77	57.24
4.00	39.00	875.00	1048.53	54.13
4.25	34.00	902.58	1006.83	52.11
4.50	32.00	859.60	968.53	49.49
4.75	31.00	838.48	932.63	47.06
5.00	30.00	809.79	899.43	44.83
5.25	28.00	777.93	862.79	42.43
5.50	2.00	729.31	806.93	39.31
5.75	1.00	667.60	736.31	36.71
6.00	0.00	608.17	668.63	33.66

\*\*\*\*\*

1/2 PMP (AMC II)

HYDROGRAPH COMPUTATION		DATE <u>April 21, 1981</u> COMPUTED BY <u>BFS</u> CHECKED BY _____		
<div style="text-align: center;">Project <u>Colonia Country Club - 16th Hole</u></div> <div style="text-align: center;">DR. AREA <u>0.04</u> SQ. MI.    STRUCTURE CLASS _____</div> <div style="text-align: center;"><math>T_c</math> <u>0.20</u> HR.    STORM DURATION <u>6</u> HR.</div> <div style="text-align: center;">POINT RAINFALL <u>16.94</u> IN.</div> <div style="text-align: center;">ADJUSTED RAINFALL:</div> <div style="text-align: center;">AREAL: FACTOR _____ IN. _____</div> <div style="text-align: center;">DURATION: FACTOR _____ IN. _____</div> <div style="text-align: center;">RUNOFF CURVE NO. <u>68</u></div> <div style="text-align: center;"><math>Q</math> <u>12.36</u> IN.</div> <div style="text-align: center;">HYDROGRAPH FAMILY NO. <u>2</u></div> <div style="text-align: center;">COMPUTED <math>T_p</math> <u>0.14</u> HR.</div> <div style="text-align: center;"><math>T_o</math> <u>5.20</u> HR.</div> <div style="text-align: center;"> <math>(T_o / T_p)</math>            COMPUTED <u>37.14</u> ;    USED <u>36</u> </div> <div style="text-align: center;">REVISED <math>T_p</math> <u>0.144</u></div> <div style="text-align: center;"> <math>q_p = \frac{484A}{REV. T_p} = \frac{484 \times 0.04}{0.144} = 134.44</math> CFS.         </div> <div style="text-align: center;"> <math>(Q \times q_p) = 1661.73</math> CFS.         </div> <div style="text-align: center;"> <math>n COLUMN = (T / T_p) REV. T_p</math>    <math>q COLUMN = (q_c / q_p) Q \times q_p</math> </div> <div style="text-align: center;"> <math>Q' COLUMN = (Q_t / Q) Q</math> </div>		$t = (T / T_p) REV. T_p$ t HOURS	$q = (q_c / q_p) Q \times q_p$ q CFS	$Q_t = (Q_t / Q) Q$ Q INCHES
		1	0	0
	2	0.26	3	
	3	0.52	10	
	4	0.77	20	
	5	1.03	32	
	6	1.29	95	
	7	1.55	261	
	8	1.80	173	
	9	2.06	113	
	10	2.32	78	
	11	2.58	66	
	12	2.84	56	
	13	3.09	50	
	14	3.35	43	
	15	3.61	42	
	16	3.87	38	
	17	4.12	35	
	18	4.38	33	
	19	4.64	32	
	20	4.90	30	
	21	5.16	28	
	22	5.41	12	
	23	5.67	2	
	24	5.93	0	
	25			
	26			
	27	check:	$(.26) (1252) = 12.62$	
	28		645 (0.04)	
	29			OK
	30			
	31			
	32			
	33			
	34			

Winsett-Simmonds, Consterline & Associates, Inc.

421 SOUTH BARKSDALE STREET P O BOX 10041 MEMPHIS, TENNESSEE 38104

TELEPHONE (901) 274-0400

*Systems Engineering*

CFS

COLONIAL COUNTRY CLUB - 16th HOLE  
HYDROGRAPH  
100 YEAR (AWC III)

100

80

55

60

40

20

0

Inflow

Outflow

TIME (Hours)

6

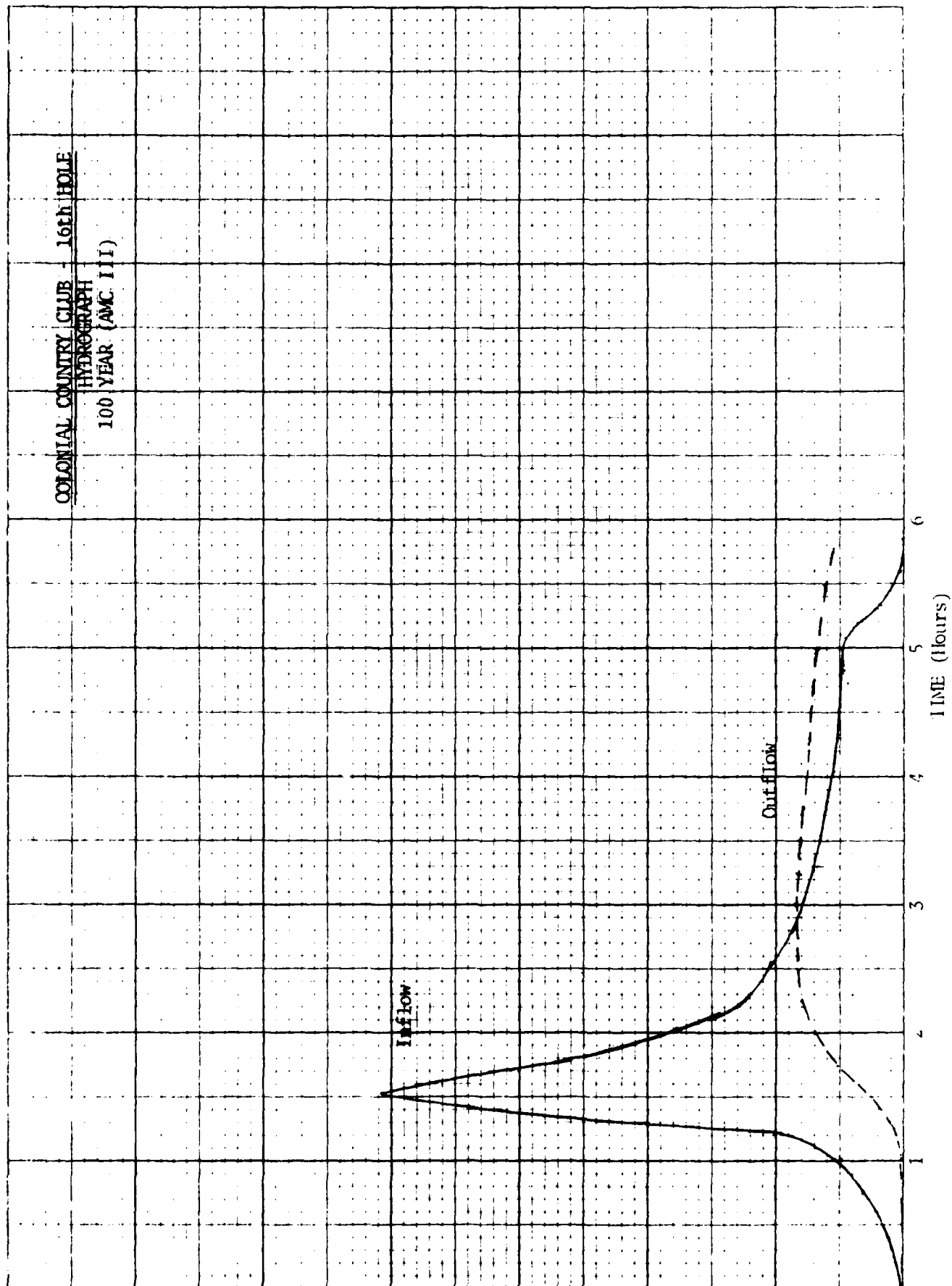
5

4

3

2

1



\*\*\*\*\*  
NAME OF DAM 00010000

STORM=100 YEAR  
TIME INCREMENT IN HOURS = 0.25

TIME	1-CP5-	2S-DT-0	2S-DT-10	0-CP-
0.00	0.00	0.00	0.00	0.00
0.25	1.90	0.99	1.00	0.01
0.50	3.90	4.90	4.93	0.04
0.75	6.00	13.55	13.90	0.17
1.00	10.00	28.60	29.55	0.45
1.25	30.00	65.69	63.60	1.47
1.50	81.00	167.33	177.69	5.11
1.75	90.00	203.14	304.33	10.20
2.00	36.00	346.24	374.14	13.60
2.25	25.00	376.01	407.24	15.60
2.50	21.00	389.27	422.01	16.37
2.75	18.00	394.87	428.27	16.70
3.00	16.00	395.41	428.87	16.70
3.25	14.00	392.31	425.41	16.68

3.50	10.00	386.84	419.31	16.7
3.75	12.00	380.14	411.34	15.55
4.00	11.00	372.33	403.14	15.4
4.25	11.00	364.41	394.80	14.54
4.50	10.00	356.39	385.41	14.51
4.75	10.00	348.27	376.33	14.00
5.00	9.00	340.05	367.27	13.31
5.25	6.00	329.03	355.01	12.55
5.50	2.00	312.75	337.03	11.71
5.75	0.00	292.59	314.76	11.01

\*\*\*\*\*

100 YEAR (AMC III)

## HYDROGRAPH COMPUTATION

DATE April 21, 1981COMPUTED BY KJG

CHECKED BY \_\_\_\_\_

Project Colonial Country Club - 16th  
HoleDR. AREA 0.04 SQ. MI. STRUCTURE CLASS \_\_\_\_\_ $T_c$  0.20 HR. STORM DURATION 24 HR.POINT RAINFALL 5.6 IN.

ADJUSTED RAINFALL:

AREAL: FACTOR \_\_\_\_\_ IN. \_\_\_\_\_

DURATION: FACTOR \_\_\_\_\_ IN. \_\_\_\_\_

RUNOFF CURVE NO. 84 $Q$  3.82 IN.HYDROGRAPH FAMILY NO. 2COMPUTED  $T_p$  0.14 HR. $T_o$  5.12 HR. $(T_o / T_p)$ COMPUTED 36.57; USED 36REVISED  $T_p$  0.142 $q_p = \frac{484A}{REV. T_p} = \frac{136.3}{0.142} = 959.86$  CFS. $(Q \times q_p) = 520.81$  CFS.W COLUMN =  $(T_p / REV. T_p)$   $q$  (COLUMN) =  $(q_c / q_p \times Q \times q_p)$  $Q$  (COLUMN) =  $(Q_t / Q)$ 

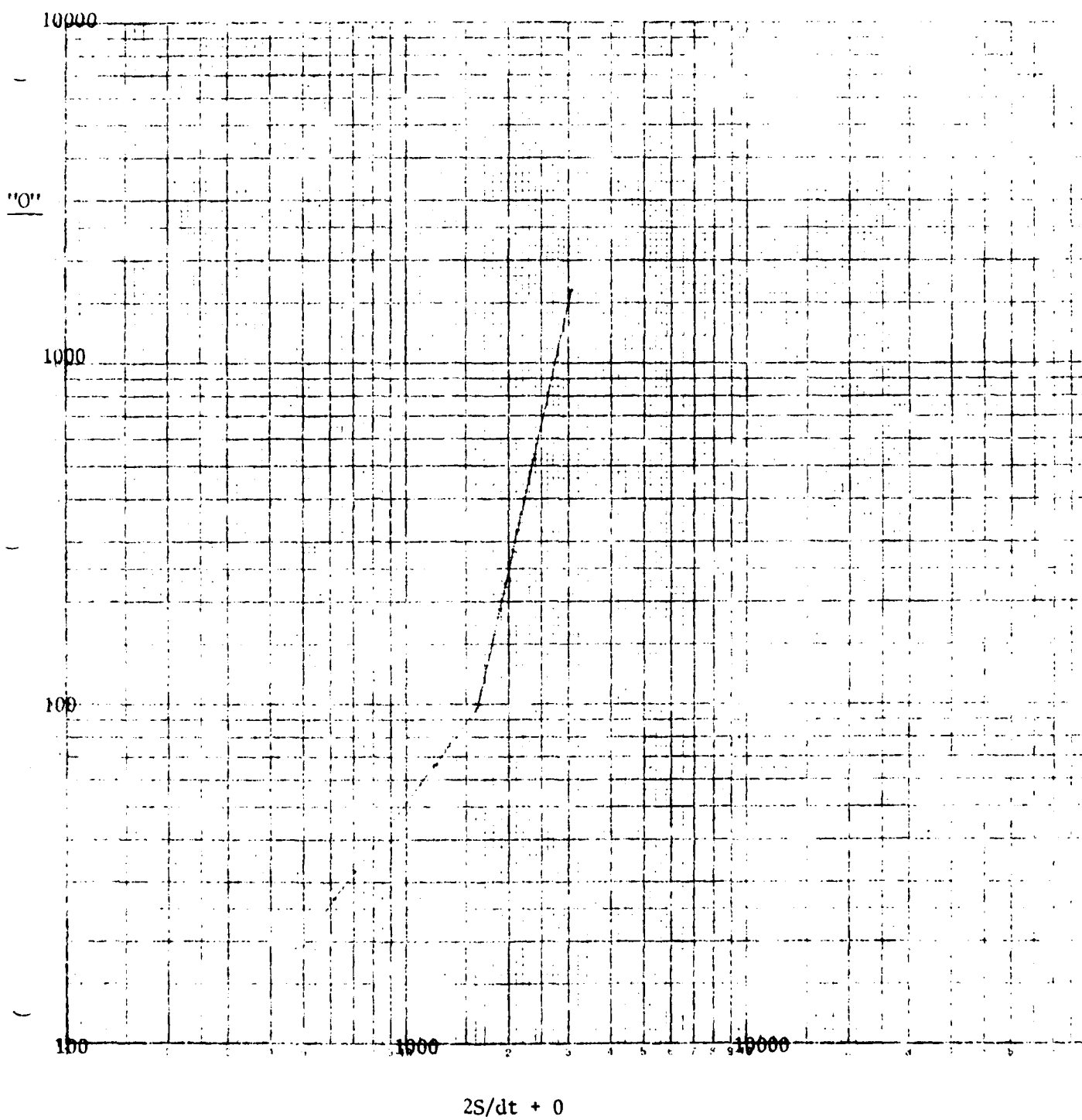
	$t = (T_p / REV. T_p)$	$q = (q_c / q_p \times Q \times q_p)$	$Q_t = (Q_t / Q)$
	$t$ HOURS	$q$ CFS	$Q$ INCHES
1	0	0	0
2	.25	1.04	
3	.50	3.12	
4	.76	6.24	
5	1.01	9.89	
6	1.27	29.68	
7	1.52	81.76	
8	1.77	54.16	
9	2.03	35.41	
10	2.28	24.47	
11	2.54	20.83	
12	2.79	17.70	
13	3.05	15.62	
14	3.30	13.54	
15	3.55	13.02	
16	3.81	11.97	
17	4.06	10.93	
18	4.32	10.41	
19	4.57	9.89	
20	4.82	9.37	
21	5.08	8.85	
22	5.33	3.65	
23	5.59	.52	
24	5.84	0	
25			
26			
27	check: $(.26) (394) = 3.97$		
28	645 (.04) <u>OK</u>		
29			
30			
31			
32			
33			
34			

Winsett-Simmonds, Constable &amp; Associates, Inc.

421 SOUTH BARKSDALE STREET P.O. BOX 10045 MEMPHIS, TENNESSEE 38104

TELEPHONE 901 274-0400

STORAGE INDICATION CURVE  
COLONIAL LAKE





POWER CURVE FIT EQUATION

\*\*\*\*\*

PROJECT = COLUMBIAL LAKE (ST. 1) OF EDWARDS

YEAR = 1960

A = 1.0000000000000000

B = 1.0000000000000000

COEFF. OF DETERMINATION = 0.991

\*\*\*\*\*

\*\*\*\*\*

POWER CURVE FIT EQUATION

\*\*\*\*\*

PROJECT = COLUMBIAL LAKE (ST. 2) OF EDWARDS

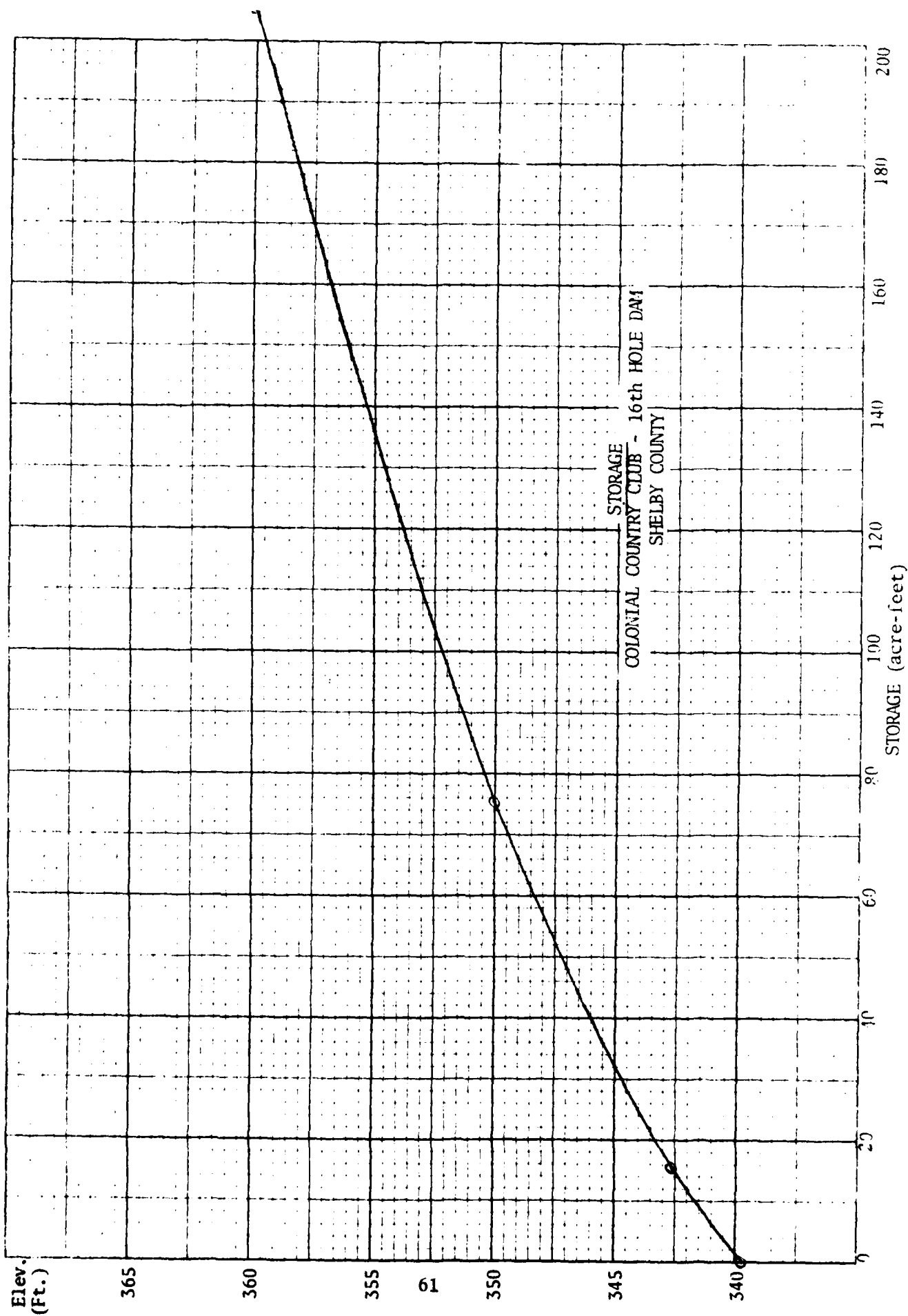
YEAR = 1960

A = 1.0000000000000000

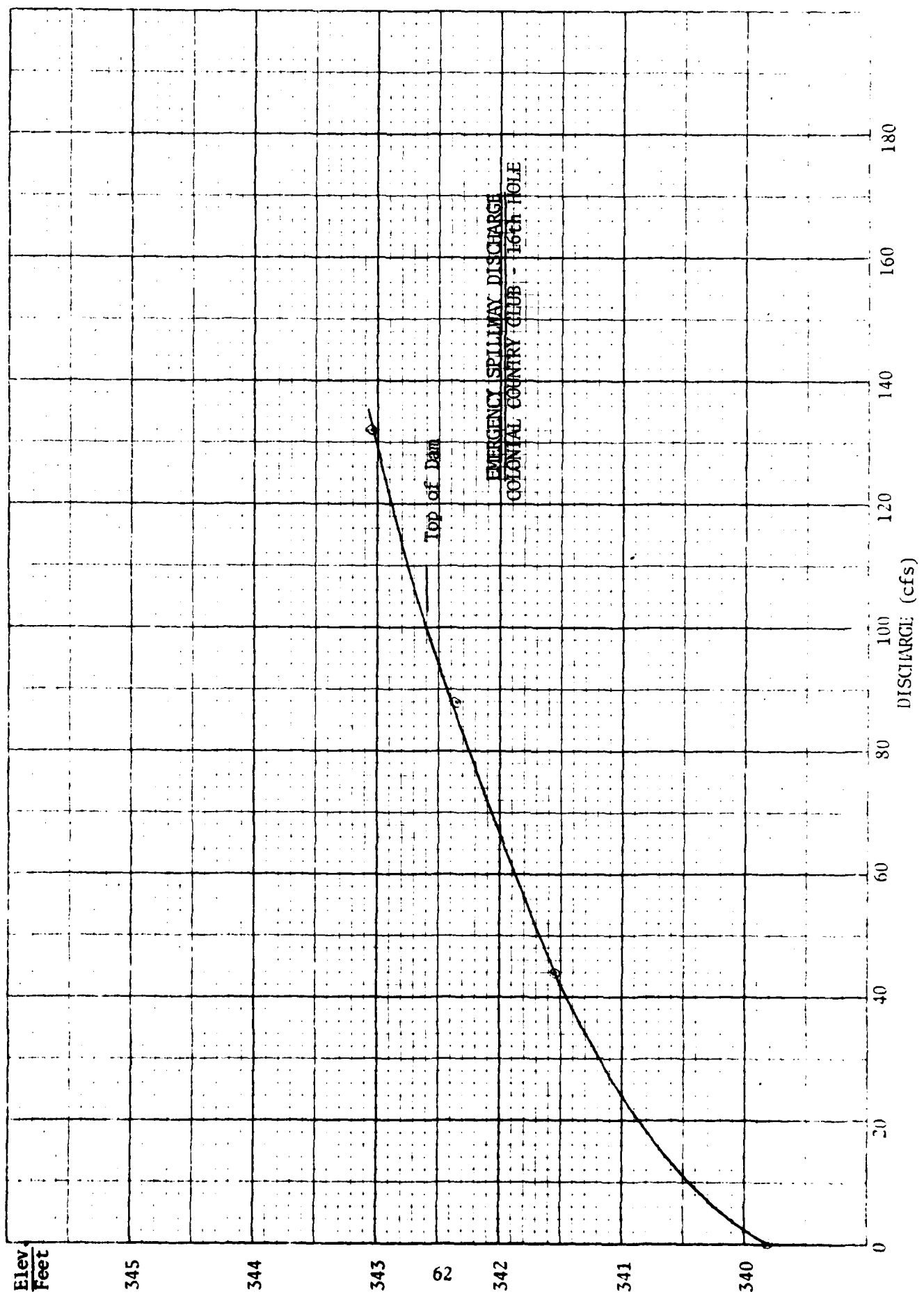
B = 1.0000000000000000

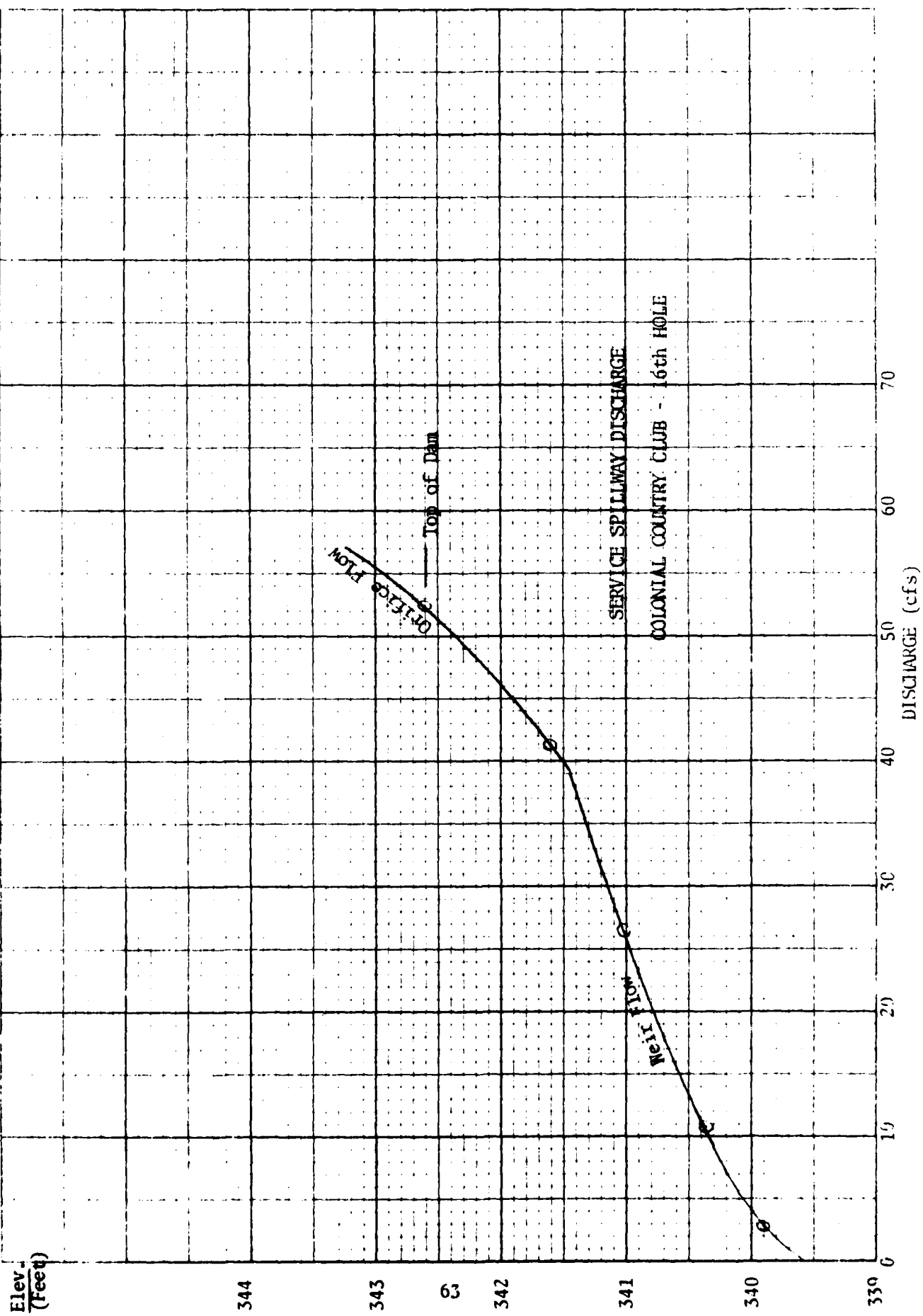
COEFF. OF DETERMINATION = 0.994

\*\*\*\*\*



461/80





Elev. -  
(Feet)

DISCHARGE (cfs)

Outside Flow

Top of Dam

SERVICE SPILLWAY DISCHARGE

COLONIAL COUNTRY CLUB - 16th HOLE

Weir Flow

COLONIAL COUNTRY CLUB - 16th HOLE DAM  
 Emergency Spillway Calculations L = 50'  
 with vertical slopes at entrance and exit.

DISCHARGE PER FOOT OF WIDTH (See attached SCS std. dwg. No. 124)

Qcfs	H <sub>p</sub> ft.
5	1.73
10	2.57
15	3.27
20	3.87

TOTAL Q (width 8.8 ft.)

Qcfs	Elev.
44	341.53
88	342.37
132	343.07

INTAKE STRUCTURE L = 5.3' Weirflow

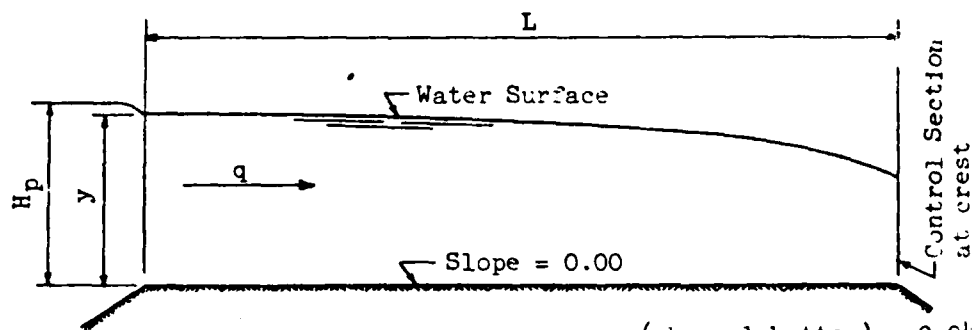
$$Q = CLH^{3/2} \quad C = 3.0 \quad O = 239.6$$

Elev.	H	CL	Q
239.6	0.0	15.90	0
239.9	0.3	15.90	2.61
240.37	0.77	15.90	10.74
241.0	1.40	15.90	26.34
242.0	2.40	15.90	59.12

INTAKE STRUCTURE Oriface Flow  $Q = \frac{2}{3}L \sqrt{2g} (h_2^{3/2} - h_1^{3/2})$   
 Elev. Sill Oriface 239.6; L = 5.3

Elev.	$\sqrt{2g}$	$\frac{2}{3}L$	$h_2$	$h_1$	$h_2^{3/2} - h_1^{3/2}$	Q
239.6	0	0	0	0	0	0
239.99	8.02	3.50	0.39	-0.39	0	13.57
240.37	8.02	3.50	0.77	0.0	0.77	18.96
240.6	8.02	3.50	1.0	0.23	0.89	24.97
241.6	8.02	3.50	2.0	1.23	1.47	41.20
242.6	8.02	3.50	3.0	2.23	1.87	52.35

# **EARTH SPILLWAYS: Values of $H_p$ and $y$ for given values of $q$ and $L$**



$n$  (channel bottom) = 0.04  
side friction neglected  
channel width = 1.00 ft

$H_p$ given in top figures; $y = H_p - v^2/2g$ given in bottom figures						
$L$ in ft	$q = 5$ cfs	$q = 10$ cfs	$q = 15$ cfs	$q = 20$ cfs	$q = 30$ cfs	$q = 40$ cfs
20.0	1.56	2.40	3.09	3.68	4.75	5.72
	1.37	2.02	2.55	2.98	3.76	4.47
40.0	1.69	2.52	3.21	3.81	4.89	5.86
	1.52	2.20	2.75	3.31	4.05	4.78
60.0	1.77	2.62	3.32	3.92	5.01	5.98
	1.62	2.33	2.90	3.38	4.32	4.97
80.0	1.83	2.69	3.40	4.02	5.11	6.08
	1.70	2.43	3.02	3.51	4.58	5.14
100.0	1.89	2.76	3.48	4.10	5.20	6.17
	1.76	2.52	3.12	3.73	4.51	5.28
120.0	1.94	2.83	3.55	4.18	5.28	6.26
	1.82	2.60	3.21	3.73	4.53	5.41
140.0	1.99	2.89	3.61	4.25	5.36	6.35
	1.88	2.67	3.29	3.82	4.74	5.53
160.0	2.03	2.94	3.68	4.31	5.43	6.41
	1.93	2.73	3.37	3.90	4.83	5.63
180.0	2.07	2.99	3.73	4.37	5.50	6.49
	1.97	2.79	3.43	3.98	4.92	5.73
200.0	2.11	3.03	3.79	4.43	5.56	6.55
	2.01	2.84	3.50	4.05	5.00	5.82

REFERENCE

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
ENGINEERING DIVISION - DESIGN SECTION

STANDARD DWG NO

ES-124

SHEET 1 OF 7

DATE 11-21-55

APPENDIX F  
DAM INVENTORY DATA SHEET

DAM INVENTORY DATA SHEET  
DEPARTMENT OF CONSERVATION  
DIVISION OF WATER RESOURCES

ID NUMBERS STATE(ID): 79-7077 FEDERAL(FED ID): TN-15774  
NAME(PROJECT): Colonial Country Club 16th Hole REGION(R): West  
OWNER(S): Colonial Country Club (Jerry Takushi - Greens Maintenance)  
ADDRESS: 2736 Countrywood Parkway, Memphis, TN 38134  
TELEPHONE RESIDENCE: \_\_\_\_\_ BUSINESS: 377-7349  
COUNTY: Shelby QUAD: 409NE-Ellendale  
LOCATION LATITUDE: 35° 11' 22", LONGITUDE: 89° 47' - 07"  
STREAM(SOURCE): Trib. Fletcher Creek RIVER MILE: \_\_\_\_\_ BASIN: 44B  
PURPOSE OF DAM: Recreation YEAR COMPLETE: 1965  
CONTRACTOR(CONT): Unknown LOCATION: \_\_\_\_\_  
ENGINEER(ENG): Unknown LOCATION: \_\_\_\_\_  
TYPE OF DAM(TYC): Earth SIZE CLASSIFICATION: Small  
DOWNSTREAM HAZARD POTENTIAL CLASSIFICATION STATE(H) 1 FEDERAL(FH) High  
CERTIFICATE EXPIRATION DATE(EXP DATE): \_\_\_\_\_  
STRUCTURAL HEIGHT(SHT): 25 FEET, HYDRAULIC HEIGHT(HHT): 22.3 FEET  
CREST LENGTH(LGTH): 344 FEET, CREST WIDTH(WDTH): 10-15 FEET  
UPSTREAM SLOPE(U/S): 3.8 :1, DOWNSTREAM SLOPE (D/S): 2.6 :1  
POOL AREA NORMAL(NSURF): 4.6 ACRES, MAXIMUM(M/SURF): 6.2 ACRES  
ELEVATION(FEET MSL), STORAGE CAPACITY(ACRE-Feet)  
TOP OF DAM (ELEV1) 342.5, (TO/STR) 45.5  
EMERGENCY SPILLWAY CREST (ELEV2) 339.8, (EM/STR) 30.2  
NORMAL POOL (ELEV3) 339.7, (N/STR) 29.8  
EMERGENCY SPILLWAY MATERIAL(ESM) Veg earth, SIZE(SZ) 6'  
SERVICE SPILLWAY MATERIAL(SSM) Conc pipe, SIZE(SZ) 30"  
DRAINAGE AREA(DA): .04 SQ. MILES, CURVE NUMBER(CN): 68 AMCII  
TIME OF CONCENTRATION(TC): .2 HOURS, MAXIMUM 6-HR RAIN: 29.7 INCHES  
COMMENTS: INVENTORIED BY: Moore & Armstrong DATE: 8/14/80  
REVISED BY: \_\_\_\_\_ DATE: \_\_\_\_\_ D/S HAZARD BY: Moore DATE: 8/14/80  
OTHER NAME OF PROJECT: \_\_\_\_\_ POOL AREAS OBTAINED BY: Quad  
OTHER CONTACT AT DAM: \_\_\_\_\_ PHONE: \_\_\_\_\_  
DATA OBTAINED FROM: Phase I inspection  
EMER. SPIL. DESC.: Trapezoidal earth channel; rt side Z=14.3; lt side Z=6.5  
SERV. SPIL. DESC.: Drop inlet in emergency spillway entrance channel  
ELEVATIONS REF. TO: Top of manhole at toe APPROX ELEV: 320.32 FT MSL  
DRAWDOWN DRAIN: MATERIAL: N/A SIZE: \_\_\_\_\_ ELEVATION: \_\_\_\_\_  
OTHER COMMENTS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



APPENDIX G  
HAZARD POTENTIAL  
AND  
CONDITION CLASSIFICATION DEFINITIONS

DEPARTMENT OF THE ARMY  
OFFICE OF THE CHIEF OF ENGINEERS  
HAZARD POTENTIAL CLASSIFICATION\*

<u>Category</u>	<u>Loss of Life</u>	<u>Economic Loss</u>
Low	None expected (No permanent structures for human habitation)	Minimal (Undeveloped to occasional structures or agriculture)
Significant	Few (No urban developments and no more than a small number of inhabitable structures)	Appreciable (Notable agriculture, industry or structures)
High	More than few	Excessive (Extensive community, industry or agriculture)

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\*U.S. Army Corps of Engineers, Recommended Guidelines for Safety Inspection of Dams.

TENNESSEE DEPARTMENT OF CONSERVATION

DIVISION OF WATER RESOURCES

DAMAGE POTENTIAL CATEGORY\*

<u>Category</u>	<u>Description</u>
1.	Dams located where failure would probably result in any of the following: loss of human life; excessive economic loss due to damage of downstream properties; excessive economic loss, public damage to roads or any public or private utilities.
2.	Dams located in predominantly rural or agricultural areas where failure may damage downstream private or public property but such damage would be relatively minor and within the general financial capabilities of the dam owner. Public hazard or inconvenience due to loss of roads or any public or private utilities would be minor and of short duration. Chances of loss of human life would be possible but remote.
3.	Dams located in rural or agricultural areas where failure may damage farm buildings or agricultural land but such damage would be more or less confined to the dam owner's property. No loss of human life would be expected.

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\*Tennessee Department of Conservation, Division of Water Resources, Rules and Regulations Applied to the Safe Dams Act of 1973. Chapter 0400-4-1.

## DEFINITION OF CONDITION CLASSIFICATION

"Unsafe - Emergency" - A dam in a state of imminent failure. State and local authorities and downstream residents should be advised immediately, reservoir drained, or combination of the above (e.g., advanced piping, major slope instability, recent sudden collapse of a portion of the foundation, imminent overtopping, etc.).

"Unsafe - Nonemergency" - A dam with obviously serious deficiencies which clearly could develop, or are developing, into failure modes but do not yet pose the threat of imminent failure. State and local authorities should be advised promptly and remedial work should begin as soon as practical. Someone should be assigned to periodically check on the dam's condition until remedial work is begun. Drawing down the reservoir should be considered, e.g., flowing seepage from embankment which could lead to piping, evidence of solution channels or cavitation in the foundation, seriously inadequate spillway capacity as per ETL 1110-2-234, history of recurring slope instability, etc.).

"Significantly Deficient" - A dam with deficiencies which, if left unchecked, would likely become serious deficiencies and could ultimately result in failure. Advise State authorities and recommend remedial work be scheduled in time to prevent substantial further deterioration of the condition(s) - usually within 6 months to a year or sooner (e.g., heavy growth of sizeable trees on slopes, potentially serious erosion, spillway discharge channel too close to embankment, etc.).

"Deficient" - A dam with deficiencies which need attention but which would not likely effect the safety of the dam unless left unchecked for a long period of time. Advise State authorities and recommend remedial action at owner's convenience but before the problem can escalate into a significant deficiency (e.g., brush and/or few or very small trees on embankment, long term deterioration of masonry or metal outlet features, formation of deep ruts in embankment roadway, deterioration of riprap, etc.).

"Not Deficient" - Well constructed and maintained dam with no apparent deficiencies relative to its safety and structural integrity.

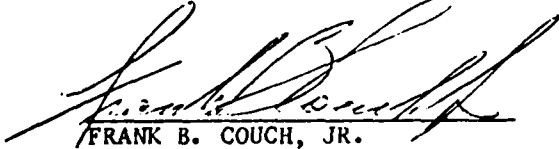
APPENDIX H  
CORRESPONDENCE


NON-FEDERAL DAM INSPECTION REVIEW BOARD  
PO BOX 1070  
NASHVILLE, TENNESSEE 37202

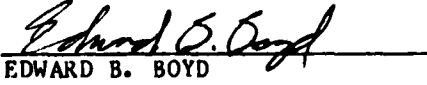
ORNED-G


Commander  
US Army Engineer District, Nashville  
PO Box 1070  
Nashville, TN 37202

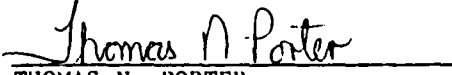
1. The Interagency Review Board, appointed by your Memorandum of 8 October 1981, presents the following after meeting on 2 June 1981 to consider the Phase I investigation report on Colonial Country Club-16th Hole Dam performed by Winsett-Simmonds, Consterdine & Associates, Inc., under contract to the Tennessee Department of Conservation.
2. Item 4 of recommendations should be revised to include the repair of the jug hole at Station 3+20.
3. The conclusions should state that there was no evidence of slope instability.
4. An emergency action plan should be developed, including a warning system to alert downstream residents, in the event a serious condition develops with the project.
5. The Board considered the information contained in the report and agreed with the conclusions and recommendations following minor revisions.


  
FRANK B. COUCH, JR.  
Chief, Geotechnical Branch  
Chairman

  
ROBERT A. HUNT  
Director, Div of Water Resources  
State of Tennessee

  
EDWARD B. BOYD  
Hydrologic Technician  
Alternate, US Geological Survey

  
JAMES GUNNELS  
Structural Engineer  
Alternate, Design Branch

  
THOMAS N. PORTER  
Hydraulic Engineer  
Alternate, Hydrology & Hydraulics Branch

  
O'GENE W. BARKEMEYER  
State Conservation Engineer  
Soil Conservation Service

**DATE**  
**ILME**